
4.13 CUMULATIVE EFFECTS

4.13.1 Introduction

Cumulative impacts may result when the environmental effects associated with a proposed project are added to temporary (construction-related) or permanent (operations-related) impacts associated with other past, present, or reasonably foreseeable future projects. Although the individual impact of each separate project might not be significant, the additive or synergistic effects of multiple projects could be significant. This cumulative analysis focuses on potential impacts from the proposed Project on resource areas or issues where their incremental contribution would be potentially significant when added to the potential impacts of other actions.

An action must first meet three criteria to be a candidate for inclusion in the cumulative analysis. The action must:

- affect a resource (e.g., forests) or resources potentially affected by the proposed project;
- cause this impact within all, or part of, the project area; and
- cause this impact within all, or part of, the timespan for the potential impact from the proposed project.

Existing environmental conditions in the vicinity of the proposed slip, LNG terminal, and pipeline and associated aboveground facilities reflect the extensive changes brought about by long-term human occupancy and use of the Project area. For example, native vegetative communities in the Project area have been substantially altered from their pre-Euro-American settlement condition by timber harvest, agricultural practices, introduction of non-native species, and commercial/industrial and residential developments; rivers and streams have been physically altered; and fish and wildlife resources have been impacted by habitat alteration or loss.

Current and reasonably foreseeable projects within the fifth-field watersheds in the Project area that may cumulatively impact resources that would be affected by construction and operation of the proposed slip, LNG terminal, and pipeline and associated aboveground facilities are listed in table 4.13.1-1. The acres of impact associated with these projects, the acres impacted by the proposed Project, and the cumulative acres impacted are displayed by watershed in table 4.13.2-1.

In addition to the current and reasonable foreseeable projects identified in table 4.13.1-1, two other natural gas pipelines are currently proposed in Oregon. They are the Palomar and Ruby pipelines, described below.

On August 30, 2007, the FERC accepted a request from Palomar Gas Transmission, LLC (Palomar), to initiate the Pre-filing environmental review process for its proposed new pipeline project, also in Oregon. As currently planned, the Palomar Project would include about 215 miles of 36-inch-diameter pipeline, with a bi-directional flow capable of handling up to 1.4 Bscfd of natural gas. The pipeline would begin at an interconnection with GTN northwest of Madras, and extend over portions of Wasco, Clackamas, Marion, Yamhill, Washington, Columbia, and Clatsop Counties, Oregon. Potential environmental impacts resulting from

construction and operation of the Palomar pipeline would be similar to those described for this Project. However, due to the fact that the Palomar Project, as currently planned, is not located in any of the fifth-field watersheds affected by this Project, there would be no cumulative impacts associated with the Palomar Pipeline Project to these watersheds.

The Ruby pipeline would be a 42-inch-diameter pipeline that would extend for about 680 miles from the Opal Hub in southwestern Wyoming to the Oregon/California border near Malin, Oregon, where it could interconnect with three interstate natural gas pipelines. The Ruby pipeline would be designed to eventually transport up to 2.0 Bscfd. The purpose of the Ruby Project is to deliver Rocky Mountain gas to markets in northern California and northern Nevada. Potential environmental impacts resulting from construction and operation of the Palomar pipeline would be similar to those described for this project. However, due to the fact that the current route proposed by Ruby travels away from areas impacted by the Pacific Connector pipeline, cumulative impacts associated with the Ruby Pipeline Project would be primarily limited to the area near the interconnection near Malin, Oregon.

Additional projects that may occur within the watersheds are anticipated as population growth continues in the region. Associated road and commercial development, as well as maintenance and upgrading of the existing infrastructure, are therefore likely to occur in the foreseeable future. Within the Project area, gradual habitat and water quality improvements may also occur over time as federal, state, and private conservation and habitat enhancement efforts are implemented. It is not possible to quantify or assess the potential cumulative impacts or benefits that may occur from future projects that may occur within the watersheds as population growth, associated road and commercial development, as well as maintenance and upgrading of the existing infrastructure occur. Within the Project area, gradual habitat and water quality improvements may also occur over time as federal, state, and private conservation and habitat enhancement efforts are implemented.

Projects that may occur but are not practical to predict or identify in table 4.13.1-1 include the following:

- **Reciprocal Rights-of-Way Actions.** All of the fifth-field watersheds are covered by multiple reciprocal road use and rights-of-way agreements enacted between the BLM and adjoining industrial forest landowners. While requests are frequently received, under the terms of these agreements, to construct new roads or to renovate, improve, and use existing roads, there is no practical means to forecast the timing and location of such requests. Historically, the Districts receive between about five and ten crossing requests annually from major timber companies, which may or may not involve construction of new roads.
- **Temporary Hauling Permits.** Requests are received from time to time from private individuals without reciprocal road use and rights-of-way agreements for permits to haul forest products over BLM-controlled roads. As with non-discretionary actions permitted under reciprocal road use and rights-of-way agreements, there is no practical means by which to forecast the timing and location for such requests. Historically, the Districts receive less than five requests annually from small landowners, which may or may not involve construction of new roads.

- **Pre-commercial Thinning and Manual Maintenance (Brushing).** Silvicultural treatments of young stands (generally less than 16 years old) will continue as these stands reach their target condition.
- **Livestock Grazing and Fence Maintenance.** Almost all acreage within the watersheds crossed on the Klamath Falls Resource Area by the proposed pipeline is allotted to livestock grazing. Grazing use occurs during the spring and summer months. Fence maintenance can occur any time during the grazing season.
- **Other Actions.** Within the Coos Bay District, BPA is currently improving (rocking) and renovating its powerline access roads. It is anticipated this action will continue for the next several years.

Road maintenance operations would continue at the current rate. Road maintenance activities are directly related to timber hauling activities and increases in private timber company operations would result in more road maintenance in that geographical area.

The BLM Districts have active noxious weed programs. Noxious weeds would continue to be chemically treated adjacent to BLM roads within these project areas. These treatments occur during the spring and summer months.

TABLE 4.13.1-1.		
Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern		
Activity	Project Description	Construction Dates
Coos Bay Frontal Watershed		
Port owned General Cargo Dock at Slip	The Port would construct and own a dock for unspecified general cargo on the west side of the slip proposed for Jordan Cove LNG. This dock would likely accommodate a "roll on-roll off" type terminal, although an intended user has not yet made a commitment to the Port to locate there. The cargo dock would be about 1,200 feet long and 70 feet wide, supported by 774 24-inch octagonal concrete pilings. Serving the cargo dock would be an impervious paved access and staging area covering about 1.7 acres. The Port has not identified a date for construction or operation of this general cargo dock.	unknown
Blue Retro Density Management Thinning Study	Thin 30 acres of mid-seral forest in Matrix and 15 acres in Riparian Reserves. Includes renovation of 2.1 miles road (brushing, grading, rock replacement)	2009
North Spit Barge Slip at Southport Forest Products	Approximately 32 acre development of multimodal barge facility with access to rail and road. The existing barge slip will be reconfigured to handle ocean going cargo barges able to move inbound logs, outbound woodchips and a variety of general cargo.	2009 or later
TransPacific Parkway Realignment	The realignment would combine two road/rail crossings into a single signalized crossing and create safer intersection access for visitors to the southern portion of the Oregon Dunes National Recreation Area, as well as to nearby industrial sites.	2007
Coos Bay Channel Modification	Modify the Coos Bay navigational channel from the entrance at the Pacific Ocean to the railroad bridge located at approximately RM 9.2	2009 or later
Lower Coquille River Watershed		
No identified current or reasonably foreseeable projects-		
North Fork Coquille Watershed		
South Powerstrip Commercial Thinning	Thin 134 acres mid-seral forest in Matrix and 131 acres in Riparian Reserves. Includes 19 acres of alder conversion in primarily in Riparian Reserves. Project includes 1.3 miles of temporary new road construction; 0.6 mile of road improvement (widening, new road surface); and 1.7 miles of road renovation; and 1.4 miles of road decommissioning.	To be completed by 2009

TABLE 4.13.1-1.

Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern

Activity	Project Description	Construction Dates
North Powerstrip Commercial Thinning	Thin 121 acres mid-seral forest in Matrix and 101 acres Riparian Reserves. Project includes 7 acres of alder conversion primarily in Riparian Reserves. Project includes 1.6 miles of temporary new road construction; 0.3 mile of road improvement; 2.3 miles of road renovation; and 2.3 miles of road decommissioning.	To be completed by 2008
McKinley Garage Commercial Thinning	Thin 116 acres mid-seral forest in Matrix and 113 acres Riparian Reserves. Project includes 14 acres of alder conversion in Matrix and Riparian Reserves. Project includes 0.7 mile of temporary new road construction; 0.6 miles of road improvement; 1.4 miles of road renovation; and 1.3 miles of road decommissioning.	2007
Jerusalem Creek Commercial Thinning	Thin 269 acres mid-seral forest in Matrix and 251 acres Riparian Reserves and includes 142 acres of alder conversion/partial cut in Riparian Reserves. Project includes 1.9 miles of temporary new road construction; 1.1 miles of road improvement; 3.2 miles of road renovation; and 2.0 miles of road decommissioning.	To be completed by 2009
Bitter Cherry Commercial Thinning	Thin 276 acres mid-seral forest in Matrix and 134 acres Riparian Reserves and includes 89 acres of alder conversion primarily in Riparian Reserves. Project includes 1.5 miles of temporary new road construction; 2.9 miles of road improvement; 7.6 miles of road renovation; and 1.6 miles of road decommissioning.	To be offered in 2008
East Fork Coquille Watershed		
Brown Elk Timber Sale	Regeneration harvest 44 acres late-seral forest in Matrix and thin 10 acres Riparian Reserves. Represents 0.25 percent of all late-seral forest on BLM lands in the watershed. Project includes 0.2 mile of temporary new road construction; 10.6 miles of road renovation; and 0.4 mile of road decommissioning.	Ongoing, expected in next 2 to 3 years. Status: Protested Sold & Unawarded.
Scattered Skeeter Density Management Thinning	Thin 568 acres mid-seral forest in LSR and 113 acres Riparian Reserves and includes 52 acres of alder conversion in LSR and Riparian Reserves. Project includes 1.1 miles of temporary new road construction; 0.2 mile of road improvement; 24.4 miles of road renovation; and 11.3 miles of road decommissioning.	Ongoing, expected next 2 to 3 years. Status: Protested Sold & Awarded sale.
Broken Wagon Density Management Thinning	Thin 178 acres mid-seral forest in LSR and Riparian Reserves and includes 126 acres of alder conversion in LSR and Riparian Reserves. Project includes 1.3 miles of temporary new road construction; 0.1 miles road improvement; 20.6 miles road renovation; and 3.1 miles of road decommissioning.	Ongoing, expected in next 2 to 3 years. Status: Protested Sold & Awarded sale.
Burnt Brum Timber Sale	Thin 590 acres mid-seral forest in LSR and 265 acres in Riparian Reserves and includes 51 acres alder conversion in LSR and Riparian Reserves. Project includes 1.0 mile of temporary new road construction; 1.3 mile of road improvement; 24.6 miles of road renovation; and 8.6 miles of road decommissioning.	2008
Dora Reload Timber Sale	Thin 15 acres mid-seral forest in Matrix and 27 acres in Riparian Reserves and includes 43 acres of alder conversion in Matrix. Project includes no temporary new road construction; 0.5 mile of road improvement; 1.2 miles of road renovation; and 0.9 mile of road decommissioning.	2007
Knepperville Commercial Thinning	Thin 173 acres mid-seral forest in Matrix and 84 acres in Riparian Reserves and includes 14 acres alder conversion in Matrix and upland Riparian Reserves. Project includes 1.5 mile of temporary new road construction; 0.2 mile of road improvement; 10.0 miles of road renovation; and 3.6 miles of road decommissioning.	To be completed by May 2010
Lost Harry Commercial Thinning	Thin 196 acres mid-seral forest in Matrix and 168 acres in Riparian Reserves. Project includes 0.5 mile of temporary new road construction; 0.2 mile of road improvement; 10.8 miles road renovation; and 3.6 miles of road decommissioning.	2007
Elk Creek Commercial Thinning	Thin 182 acres mid-seral forest in Matrix and 122 acres in Riparian Reserves. Project includes 0.7 mile of temporary new road construction and 1.6 miles road renovation.	2007
Camas Powerline Commercial Thinning	Thin 214 acres mid-seral forest in Matrix and 82 acres in Riparian Reserves. Project includes 1.0 mile of temporary new road construction and 10.0 miles of road renovation.	2007

TABLE 4.13.1-1.

Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern

Activity	Project Description	Construction Dates
Brummed Out Density Management Thinning	Thin 325 acres mid-seral forest in LSR and Riparian Reserves and includes 94 acres of alder conversion primarily in Riparian Reserves. Project includes 1.3 miles of temporary new road construction; 0.7 mile of road improvement; and 1.2 miles of road renovation.	Offering in 2008
Cherry Wall Density Management Thinning	Thin 364 acres mid-seral forest in LSR and Riparian Reserves and includes 116 acres of alder conversion primarily in Riparian Reserves. Project includes 0.6 mile of temporary new road construction; 0.1 mile of road improvement; and 1.1 miles of road renovation.	Offering in 2008
Brummit Creek Instream Restoration Project	Place 200 logs along 3 miles of West Fork Brummit Creek by helicopter.	2007
Middle Fork Coquille Watershed		
Remote Control Regeneration Harvest	Regeneration harvest 201 acres of late-seral forest in Matrix. Represents less than 1 percent of all LSR on BLM lands in watershed. Project includes: 1.2 mile of temporary new road construction; 0.2 mile of road improvement; and 1.8 miles of road renovation.	Planned offering 2008
Think Big Commercial Thinning	Thin 243 acres of mid-seral forest in Matrix and Riparian Reserves. The number of miles of temporary road construction, road improvement, and renovation are unknown at this time.	Planned offering 2008
Slater Rocks Commercial Thinning	Thin 1,800 acres of mid-seral forest in Matrix and Riparian Reserves and includes 100 acres of alder conversion primarily in Riparian Reserves. Project includes 8+ miles of temporary new road construction.	Planned offering 2008
Smoke Screen Commercial Thinning	Thin 78 acres of mid-seral forest, 64 acres in Matrix and 14 acres in Riparian Reserves. Three acres of right-of-way clearcut. Hauling utilized 2 existing BLM roads.	2007
Taylor-Made Commercial Thinning	Thin 211 acres of mid-seral forest, 168 acres in Matrix and Connectivity/Diversity Block land use allocation, and 43 acres in Riparian Reserves. One acre of right-of-way clearcut. Hauling utilized 15 existing BLM roads and 3 private roads.	2007
Golden Gate Commercial Thinning	Thin 218 acres of mid-seral forest, 162 acres in Matrix and 56 acres in Riparian Reserves. Three acres of right-of-way clearcut. Hauling utilized 5 BLM roads and 4 private roads.	2007
Sherlock's Denn Density Management	Thin 135 acres of mid-seral forest in LSR. Three acres of right-of-way will be clearcut. Hauling would utilize 7 existing BLM roads.	To be completed end of 2008
Bogey Gap Density Management	Thin 174 acres of mid-seral forest in LSR. One acre of right-of-way will be clearcut. Hauling would utilize 10 existing BLM roads.	Contracts through March 2009
Camas Height Density Management	Thin 262 acres of mid-seral forest in unmapped LSR (marbled murrelet site) and Riparian Reserves. Hauling utilized 9 existing BLM roads and 4 private roads.	2007
Deep Six Density Management	Thin 223 acres of mid-seral forest in LSR. Project includes approximately 0.5 miles of new, permanent road construction. Hauling would utilize 6 existing BLM roads.	2008
Burma Triangle Commercial Thinning	Thin 313 acres of mid-seral forest in Matrix. Project includes approximately 0.68 miles of new, permanent road construction. Hauling would utilize 8 existing BLM roads.	2008.
Suicide Squeeze Density Management	Thin 89 acres of mid-seral forest in LSR. Approximately 0.2 miles of new, permanent road construction. Hauling would utilize 4 existing BLM roads.	2008
Olalla Creek-Lookingglass Watershed		
Dickerson Heights Regeneration Harvest	Harvest 128 acres of late-seral forest allocated to Matrix – 83 acres and 45 acres to Connectivity/Diversity Block. The harvest represents about 1.1 percent of all late-seral forest on BLM lands in watershed. Project includes 0.37 mile of new, permanent road construction. Hauling would utilize 3 existing BLM roads and 4 private roads.	Completion expected next 2 to 3 years. Status: Presently suspended.
Power Wagon Density Management	Thin 58 acres of mid-seral LSR. Project primarily located in East Fork Coquille watershed, but approximately 5 acres cross the divide into the Olalla Creek-Lookingglass Creek Watershed. Hauling utilized 1 BLM and BPA road.	2007
Deep Six Density Management	Thin 139 acres of mid-seral forest in LSR. Project includes approximately 0.5 mile of temporary road construction. Approximately 1 acre of clearcut right-of-way in early-seral stands. Hauling would utilize 7 BLM roads and one private road.	Planned 2008 sale

TABLE 4.13.1-1.

Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern

Activity	Project Description	Construction Dates
Olly Cat Density Management	Thin 511 acres of mid-seral forest in LSR. Approximately 2.9 miles of temporary road construction. Approximately 4 acres of clearcut in early-seral stands. Hauling would utilize 17 existing BLM roads and 8 private roads.	Planned 2008 sale
Pre-commercial Thinning	Thinning and manual maintenance (brushing) 270 acres.	2007
Middle South Umpqua Watershed		
Precommercial Thinning	Thinning and manual maintenance (brushing) 165 acres.	2007
Myrtle Creek Watershed		
Buck Fever Timber Sale	Harvest 230 acres of late-seral forest. Approximately 164 acres in the Matrix and 66 acres in the Connectivity/Diversity Block land use allocation. When taken together with the other three sold/unawarded sales the total harvest represents 3.3% of late-seral forest on BLM-managed lands in watershed. Estimated 0.57 mile of new road constructed, with 0.5 mile being permanent. Hauling would utilize 8 existing BLM roads.	Sold but unawarded sale from the late 1990s; a new effects analysis pending.
Class of '98 Timber Sale	Harvest 204 acres of late-seral forest with approximately 182 acres in Matrix and 22 acres in the Connectivity/Diversity Block land use allocation. When taken together with the other three sold/unawarded sales the total harvest represents 3.3% of late-seral forest on BLM-managed lands in the watershed. Estimated 1.4 mile of new road would be constructed, with 1.2 mile being permanent. Hauling would utilize 5 existing BLM roads and 2 private roads.	Sold but unawarded sale from the late 1990s; a new effects analysis pending.
Dream Weaver Timber Sale	Harvest 128 acres of late-seral forest, with 103 acres in Matrix and 25 acres in the Connectivity/Diversity Block land use allocation. When taken together with the other three sold/unawarded sales the total harvest represents 3.3% of late-seral forest on BLM-managed lands in watershed. Estimated 0.6 mile of new, permanent road would be constructed. Hauling would utilize 6 existing BLM roads.	Sold but unawarded sale from the late 1990s; a new effects analysis pending.
Sweet Pea Timber Sale	Harvest 6 acres of late-seral forest in Matrix land use allocation. When taken together with the other three sold/unawarded sales the total harvest represents 3.3% of late-seral forest on BLM-managed lands in the watershed. Hauling would utilize 1 existing BLM road.	Sold but unawarded sale from the late 1990s; a new effects analysis pending.
Rise and Fall Commercial Thinning	Thin 141 acres of mid-seral forest with 43 acres in Matrix and 65 acres in the Connectivity/Diversity Block and 33 acres in Riparian Reserves land use allocation. 0.2 mile of new, permanent road constructed. Hauling utilized six existing BLM roads.	2007
Lucky Louis Commercial Thinning	Thin 120 acres of mid-seral forest with 106 acres in Matrix and 14 acres in Riparian Reserves land use allocation. 0.2 mile of temporary road construction. Hauling utilized 5 existing BLM roads and 1 private road.	2007
Bobbin Weave Commercial Thinning	Thin 226 acres of mid-seral forest with 94 acres in Matrix, 96 acres in the Connectivity/Diversity Block and 46 acres in Riparian Reserves. 2 acres of right-of-way clearcut to accommodate the construction of 0.9 mile of new road. Hauling utilized 14 existing BLM roads and one private road.	2007
Pre-commercial Thinning	Thinning and manual maintenance (brushing) acres in 2007.	2007
Reciprocal Rights-of-Way Actions	Renovation of approximately 700 feet and construction of 300-foot extension of BLM Road No. 29-4-31.0. The proposed 300 feet of construction would remove less than 0.25 acre of mid-seral BLM forest.	2008
South Umpqua River Watershed		
Myrtle Morgan Timber Sale	Harvest 228 acres of late-seral forest with 77 acres in Matrix and 151 acres in the Connectivity/Diversity Block land use allocation. Taken together with the Screen Pass and Hi-Yo Silver timber sales, this represents approximately 1.6 percent of all late-seral forest on BLM Lands in the watershed. Estimated 1.8 miles of new roads consisting of temporary, semi-permanent and permanent roads. Approximately 1 acre clearcut right-of-way. Hauling would utilize 4 existing BLM roads and 1 private road.	Completion next 2 to 3 years Status: suspended
Screen Pass Timber Sale	Harvest 113 acres of late-seral forest in Matrix land use allocation. Approximately 0.9 mile of temporary road would be constructed requiring 1 acre of right-of-way clearcut. Hauling would utilize 6 existing BLM roads and 1 private road.	Completion next 2 to 3 years Status: suspended

TABLE 4.13.1-1.

Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern

Activity	Project Description	Construction Dates
Hi-Yo Silver Timber Sale	Harvest 142 acres of late-seral forest with 67 acres in Matrix and 75 acres in the Connectivity/Diversity Block land use allocation. 0.8 mile of new temporary and semi-permanent road constructed with less than 0.25 acre of right-of-way clearcutting. Hauling utilized 2 existing BLM roads and 4 private roads.	2007
Pre-commercial Thinning	Thinning and manual maintenance (brushing) of 199 acres.	2007
Manual Maintenance	Manual Maintenance (brushing) of 1,114 acres.	2007
Elk Creek South Umpqua Watershed		
Cattle Grazing	32,860 acres	ongoing
Joe Hall Instream Phase 2 Enhancement	1 mile – placing large wood	2007
Joe Hall Landslide Stabilization Enhancement	5 acres excavation, willow planting	2008
Brownie Instream Enhancement	3 miles – placing large wood	2008
Brownie Instream logs Enhancement	14 acres – removing blow-down trees	ongoing
Devils Knob Fuel Break	475 acres commercial thinning, pre-commercial thinning, prescribed burn.	2009
Diamond Cr. Bridge Construction	2 acres – tree removal, bridge construction	2008
Drew Vegetation	365 acres pre-commercial thinning, commercial thinning, prescribed burn.	2008
Weed Treatment	50 acres per year. Hand pulling and cutting.	ongoing
Upper Cow Creek River Watershed		
Cattle Grazing	8,250 acres	ongoing
Devils Flat Fuel Break	180 acres pre-commercial thinning.	ongoing
Cow Creek Timber Sale	3,000 acres commercial thinning, pre-commercial thinning, prescribed burning.	2010
Weed Treatment	5 acres per year	ongoing
Red Mountain fuel break	300 acres commercial thinning, 350 acres pre-commercial thinning	2009
Un-named Rock Pit Expansion	Development of a new rock pit, encompasses about 12 acres, near the existing Peavine Rock Pit	2010 or later
Trail Creek Watershed		
Precommercial Thinning	26 acres	2008
Maintenance-Underburn	189 acres	2009
Cattle Grazing	4,230 acres	ongoing
Rogue River-Shady Creek Watershed		
Butte Falls Highway	815 acres fuels – understory removal	2008
Old Ferry Road	350 acres Fuels – understory removal	2009
SE Shady Cove	456 acres Fuels – understory removal	2009
West Shady Cove	308 acres Fuels – understory removal	2010
Trail Creek	189 acres maintenance – underburn	2009
Big Butte Creek Watershed		
Bowen Arrow	615-acre timber sale	2008
Camp Cur	799-acre timber sale	2005
Camp Stew	266-acre timber sale	2005
Double Ginger	754-acre timber sale	2008
Eighty Acre	2,608-acre timber sale	2010
Lower Big Butte	467-acre maintenance underburn	2008-2010
Ranch Stew	1,208-acre pine plantation thin, residual stand thin	2008
Twin Ranch	900-acre timber sale	2008
Little Butte Creek Watershed		
Heppsie Mountain	3 million board feet regeneration harvest, commercial thinning, and density management.	Sale 2010
Bieber Wasson	170 acre maintenance underburn.	2009
East Ashland (Big Elk)	340 acres commercial timber harvest-thinning	2009
East Ashland (Big Elk)	2110 acres pre-commercial thinning	2010

TABLE 4.13.1-1.

Current or Proposed Activities Cumulatively Potentially Affecting Resources of Concern		
Activity	Project Description	Construction Dates
Camp Latgawa	117 acres hazardous fuels reduction pre-commercial thinning, hand pile and burn slash	2009
Meadow Restoration	31 acres underburning and 37 acres pre-commercial thinning	2010
Cattle Grazing	15,404 acres	ongoing
Hazard Tree Removal	In campgrounds	ongoing
Active Campgrounds	Three campgrounds along FS Road 37 are maintained and utilized in the summer.	ongoing
Snowmobile Trail Grooming	Along several FS roads that would be crossed by the pipeline.	ongoing
Spencer Creek Watershed		
Tunnel Creek DDR	252.18-acre hand cut –scatter and prescribed burn-underburn	2007-2008
Buck 13	24-acre timber sale	2008
Buck Again	823-acre timber sale	2008
Buck Indian Allotment	20,000 acres	Ongoing annually
Dead Indian Memorial and Clover Creek Highways Noxious Weed Treatment	7 miles	Ongoing annually
Klamath River John C Boyle Reservoir Watershed		
Big Bend Thinning	115-acre hand cut-pile	2007
Dorris 1	9-acre hand cut-pile	2007
Oak Thin	1,954-acre hand cut-pile	2007
KRC Oak Thin 1-6	3,815-acre hand cut-pile	2007
Pleasant Valley	884-acre prescribed burn-underburn	2007
Hamaker II	78-acre timber sale	2007
Pleasant Valley 13-3 & 7	724-acre utilization	2007
PVJ	648-acre timber sale	2008
Big Bend Thinning	115-acre prescribed burn-underburn	2008
Oak Thin	1,954-acre prescribed burn-underburn	2008
Klamath River Campground	102-acre hand cut-pile	2009
Chicken Hills DDR	174-acre utilization	2009
Lake Ewauna-Upper Klamath River Watershed		
Keno 2	199-acre prescribed burn-piles	
Lower Lost River Watershed		
FTZ 176 Mod	124-acre prescribed burn-piles	2008
FTZ 176 M	329-acre prescribed burn-piles	2008
Hill Allotment	270-acre prescribed burn-piles	2008
North Aspen	210-acre prescribed burn-piles	2008
FTZ 98-9	35-acre prescribed burn-underburn	2008
Seven Little Stukels	400-acre prescribed burn-piles	2009
FTZ 98-2	836-acre prescribed burn-underburn	2009

4.13.2 Cumulative Effects to Resources

Cumulative effects are discussed by resource below. For each resource, the potential direct and indirect impacts associated with the Project are discussed in relation to the cumulative effects that may occur if the other current, past, or reasonably foreseeable projects overlap in time or space.

In table 4.13.1-2, the impacts from other past, present, and reasonably foreseeable projects listed in table 4.13.1-1 are presented as a percentage of impacts within each watershed and are summed with the Project's expected impacts. In some of these watersheds, the cumulative impacts from the other projects represent a relatively large percentage of the total watershed area. In most cases, however, the largest projects involve ongoing cattle grazing (Elk Creek South Umpqua

Watershed, Little Butte Creek Watershed, Upper Cow Creek River Watershed, and Trail Creek Watershed), vegetation thinning (Klamath River John C Boyle Reservoir Watershed), or Indian allotment (Spencer Creek Watershed).

4.13.2.1 Geology

Aside from soil liquefaction potential at the LNG terminal site, geologic hazards related to the Project have been studied and determined not likely to present significant impacts. Pipeline design and routing would avoid significant or potential geologic hazard areas including landslides and faults. During construction, Pacific Connector would implement site-specific construction techniques and BMPs to mitigate local geological hazards that could not be completely avoided. Implementation of Pacific Connector's ECRP would minimize or avoid the potential for construction to adversely affect slope stability at known or unknown geologic hazard sites. Consequently, cumulative impacts related to landslides and fault movements are not anticipated.

Active, inactive, and planned mining sites within 0.25 mile of the Pacific Connector pipeline are identified in section 4.1. Other than mineral material sites (rock quarries), there are no reasonably foreseeable mining projects that would increase cumulative effects in the Project area. Rock removal and use from quarries managed by the BLM and the USFS may occur related to other projects identified in table 4.13.1-1 or for use by the agencies, such as for maintenance of existing roads.

It is not anticipated that the cumulative effects of rock removal from quarries would be adverse. Because removal of rock from quarries on federal lands is at the discretion of the agency, rock needed for use by the agencies would be reserved. Rock stored in quarries as a result of pipeline construction could be used or sold by the agencies in the future.

4.13.2.2 Soils and Sediments

Past land uses within watersheds crossed by the Project have disturbed soils from land clearing, residential development, forest harvest, agricultural mining, livestock grazing, and road development. These past actions removed soil cover and altered soils, increasing erosion potential and sediment yield. Any increase in land clearing and soil disturbance due to Project construction and operation has the potential to contribute to direct cumulative impacts.

The site of the proposed LNG terminal is dominated by sandy soils. About 51.3 acres are likely to become compacted during construction of on the LNG terminal site facilities.

The pipeline could disturb more than 6,000 acres of soil. Soils along the proposed pipeline route are variable. About 31 percent of the soils that would be crossed by the proposed pipeline are classified as prime farmland or farmland of statewide importance, about 4 percent are hydric soils, and 83 percent are soils prone to compaction. This disturbance has the potential to cause cumulative sedimentation impacts within the watersheds. Long-term impacts to soils are not anticipated in the TARs but would occur in the PARs. The Project impacts would be highly localized and primarily limited to the time of construction and 3 to 5 years following construction with successful reclamation.

Potential impacts on soils would be minimized through measures specified in Jordan Cove's Plan and Procedures (for the LNG terminal) and Pacific Connector's ECRP (for the pipeline). These plans were based on the FERC staff's Plan and Procedures. Pacific Connector's ECRP was modified based on input from BLM and USFS, as well as revegetation recommendations from BLM, USFS, NRCS, and County Soil and Water Conservation Districts.

Cumulative impacts to soil by erosion could occur where the LNG terminal and pipeline disturbance occurs in proximity to other planned projects within the watersheds (table 4.13.1-1). However, foreseeable silvicultural actions and associated road construction would have sufficient forest canopy remaining; most of the roads would be temporary, and all road building and maintenance would include BMPs to mitigate potential impacts to soil resources. Therefore, these projects should only have an incidental cumulative effect on soil erosion.

4.13.2.3 Water Resources and Wetlands

Groundwater

The Project would not use groundwater during construction or operations. Pipeline construction activity would be temporary and limited to surface disturbance and shallow trenching. Although trench and excavation dewatering would be required in some locations, dewatering discharge would occur on the surface and would be reintroduced to groundwater by infiltration, reducing localized impacts to groundwater. Potential cumulative impacts to groundwater from the proposed Project facilities are not expected to be measurable.

While the pipeline would require tree clearing along the Project right-of-way, which would consequently lower the transpiration potential in the immediate area of the right-of-way, the potential increase in groundwater supply in the root zone is expected to be minor and immeasurable. Similarly, where the reasonably foreseeable silvicultural actions occur within the watershed crossed by the Pacific Connector pipeline, sufficient forest canopy would remain such that no measurable effects on water yields and peak and base flows would be anticipated. Therefore, potential cumulative impacts to groundwater from cumulative forest clearing in the watersheds are expected to be insignificant.

Surface Water

Past and current activities within watersheds that contribute to surface water resources cumulative impacts include: past settlement, forest harvesting, and extensive land clearing for livestock grazing, riparian logging, bottomland use for pasture, residential developments, road building on floodplains and timber lands, stream channelization, and log transport. Water quality has been impacted through the removal of riparian shade, water withdrawals, and increased stream temperatures. Sediment delivery to streams has increased from development, land clearing, and road building. Many in-stream habitats have become degraded with loss of gravel and cobble as well as loss and degradation of pools, and depletion of LWD in streams and potential recruitment. As described in the section 4.3, construction of the Project could result in short-term impacts to waterbodies that have been previously impacted. Potential impacts on water resources would be minimized through measures specified in Jordan Cove's Plan and Procedures (for the LNG terminal) and Pacific Connector's ECRP (for the pipeline).

The proposed Project, together with the projects identified in table 4.13.1-1, are not expected to cause significant cumulative impacts to surface waters. Where silvicultural actions occur, sufficient forest canopy would remain such that no measurable effects on water yields and peak and base flows would be anticipated. None of the road construction is expected to have any cumulative effect on peak or base flows. Most roads would be temporary, and all road building and maintenance would include BMPs to mitigate potential impacts to water resources. It is not expected that forest clearing associated with pipeline construction and operations within any of the watersheds would have a measurable influence on water yields, or peak and base flows. Table 4.13.2-1 shows that impacts related to the proposed Project range from less than 0.01 percent to just over 1 percent of the affected watersheds. Therefore, we would not expect Project impacts to water resources to be cumulatively significant.

Activity	Acres	Percent of Watershed
Watershed: Coos Bay Frontal		
Other Identified Projects <u>a/</u>	166	0.09
Jordan Cove LNG terminal and Pacific Connector pipeline and associated facilities	911	0.49
Cumulative Acres	1,076	0.58
Watershed: Lower Coquille River		
Other Identified Projects <u>b/</u>	0	0.00
Pacific Connector pipeline and associated facilities	60	0.05
Cumulative Acres	60	0.05
Watershed: North Fork Coquille River		
Other Identified Projects	1,646	1.68
Pacific Connector pipeline and associated facilities	145	0.15
Cumulative Acres	1,791	1.83
Watershed: East Fork Coquille River		
Other Identified Projects <u>c/</u>	3,720	4.33
Pacific Connector pipeline and associated facilities	188	0.22
Cumulative Acres	3,908	4.55
Watershed: Middle Fork Coquille River		
Other Identified Projects	18,440	9.35
Pacific Connector pipeline and associated facilities	307	0.16
Cumulative Acres	18,747	9.51
Watershed: Olalla Creek – Lookingglass		
Other Identified Projects	1,106	1.07
Pacific Connector pipeline and associated facilities	159	0.15
Cumulative Acres	1,265	1.23
Watershed: Middle South Umpqua		
Other Identified Projects	165	0.28
Pacific Connector pipeline and associated facilities	610	1.03
Cumulative Acres	775	1.30
Watershed: Myrtle Creek		
Other Identified Projects <u>d/</u>	1,057	1.39
Pacific Connector pipeline and associated facilities	265	0.35
Cumulative Acres	1,323	1.73
Watershed: South Umpqua River Watershed		
Other Identified Projects	1,796	1.27
Pacific Connector pipeline and associated facilities	786	0.56
Cumulative Acres	2,582	1.83
Watershed: Elk Creek South Umpqua		
	54,895	

TABLE 4.13.2-1

Cumulative Acres Impacted by Watershed

Activity	Acres	Percent of Watershed
Other Identified Projects <u>e/</u>	33,771	23.88
Pacific Connector pipeline and associated facilities	47	0.09
Cumulative Acres	33,818	61.61
Watershed: Upper Cow Creek River	47,416	
Other Identified Projects	12,097	25.51
Pacific Connector pipeline and associated facilities	99	0.21
Cumulative Acres	12,196	25.72
Watershed: Trail Creek	28,867	
Other Identified Projects	4,445	15.40
Pacific Connector pipeline and associated facilities	235	0.82
Cumulative Acres	4,680	16.21
Watershed: Rouge River – Shady Creek	58,436	
Other Identified Projects	2,118	3.62
Pacific Connector pipeline and associated facilities	149	0.25
Cumulative Acres	2,267	3.88
Watershed: Big Butte Creek	43,813	
Other Identified Projects	7,717	17.61
Pacific Connector pipeline and associated facilities	97	0.22
Cumulative Acres	7,814	17.83
Watershed: Little Butte Creek	238,598	
Other Identified Projects <u>f/</u>	2,805	1.18
Pacific Connector pipeline and associated facilities	620	0.26
Cumulative Acres	3,425	1.44
Watershed: Spencer Creek	54,420	
Other Identified Projects	21,099	38.77
Pacific Connector pipeline and associated facilities <u>g/</u>	2	0.00
Cumulative Acres	21,101	38.77
Watershed: Klamath River / John C Boyle Reservoir	84,703	
Other Identified Projects	10,572	12.48
Pacific Connector pipeline and associated facilities	132	0.16
Cumulative Acres	10,704	12.64
Watershed: Lake Ewauna – Upper Klamath River	78,038	
Other Identified Projects	199	0.26
Pacific Connector pipeline and associated facilities	487	0.62
Cumulative Acres	686	0.88
Watershed: Lost River	110,118	
Other Identified Projects	2,204	2.00
Pacific Connector pipeline and associated facilities	506	0.46
Cumulative Acres	2,710	2.46

a/ Does not include TransPacific Railway Realignment. Coos Bay Channel Modification is estimated to impact 102 acres within Coos Bay.

b/ No projects have been identified in this watershed.

c/ Does not include Brummit Creek Instream Restoration Project.

d/ Does not include Pre-commercial thinning.

e/ Does not include placing large wood.

f/ Does not include Heppsie Mountain thinning.

g/ Does not include noxious weed treatments.

Potential cumulative impacts within the fifth-field watersheds could include turbidity from construction and future runoff from areas cleared during construction but not stabilized with vegetation. Pacific Connector proposes to cross waterbodies that contain flowing or standing

water at the time of construction using one of the “dry crossing” methods, which would substantially reduce in-stream turbidity caused by construction. Temporary spikes in turbidity would be expected for a short period of time during the setup and removal of structures to support the dry crossing. However, given the proposed construction sequence, it is unlikely that more than one of these temporary turbidity spikes would occur at the same time within the same fifth-field watershed. Measures from Pacific Connector’s ECRP would limit the potential for runoff from the right-of-way entering waterbodies. As a result, we do not believe that the Project would cause a discernable increase in stream turbidity even when considered cumulatively with the other projects discussed in this section.

Cumulative impacts from erosion and sedimentation could occur where the pipeline disturbance occurs in proximity to other planned projects within the watersheds. However, as previously indicated, foreseeable silvicultural actions and associated road construction would have sufficient forest canopy remaining; most of the roads would be temporary, and new permanent roads would not be connected to drainage networks. Therefore, these projects should only have an incidental effect on erosion and sedimentation.

The use of water for hydrostatic testing of the pipeline may result in the transfer of water from one drainage basin to another. However, as discussed in section 4.3.2.4, Pacific Connector would be required to adhere to all necessary permit conditions and is proposing to use methods for test water withdrawal and discharge that we believe are consistent with industry practices, and that have been shown through use on many similar pipeline projects to adequately minimize impacts on waterbodies. We have also recommended that Pacific Connector continue to consult with the federal land management agencies during development of final hydrostatic testing plans to ensure that concerns about potential transfer of test water between drainage basins are adequately addressed. Because no other projects have been identified that involve the inter-basin transfer of water and the direct and indirect effects due to the pipeline hydrostatic testing have been minimized by design measures, cumulative effects to surface water resources are not anticipated as a result of this Project component.

Within the Coos Bay Estuary, short-term cumulative impacts can be expected from the slip construction, while it would be open to Coos Bay, and the pipeline trenching and installation. As discussed in section 4.3.2.3, approximately 41 acres of the 72 acres to be dredged for the slip and access channel would be conducted in isolation from the waters of Coos Bay. However, the potential for these short-term cumulative effects would depend on the year in which these two components of this Project were implemented. Construction of both the pipeline and slip, while it would be open to Coos Bay, would be scheduled during the recommended ODFW in-water work periods between October and mid-February to minimize impacts to aquatic species in the estuary. If the access channel and slip were constructed at the same time as the pipeline, short-term cumulative increases in turbidity from channel access dredging and pipe trench excavation activities as well as construction and removal of the earthen berm used to isolate the slip could contribute to turbidity increases.

The primary cumulative impact associated with dredging is turbidity. Turbidity impacts associated with the projects discussed in this section would be of a short duration and would not be expected to overlap spatially with the JCE & PCGP Project. That is, the turbidity plumes associated with dredging would not likely be additive. Consequently, turbidity impacts are

cumulative only in the sense that a single body of water would incur these impacts. Given the volume and dynamic nature of Coos Bay, we would not expect water quality impacts to be cumulatively significant. Both Jordan Cove and Pacific Connector would develop turbidity monitoring and management plans for their Project activities, which would minimize the potential for significant short-term cumulative turbidity effects. These Project components are not expected to have a cumulative effect on water temperature because they do not involve significant shade removal or cold water supply.

Although dredging and excavation activities of both the Jordan Cove terminal and the Pacific Connector pipeline could resuspend sediment contaminants, cumulative impacts are not expected to be significant. Sediment sampling information provided by the COE indicates that potential sediment contamination is unlikely in the vicinity of the proposed slip and the pipeline. Both Jordan Cove and Pacific Connector would adhere to site-specific SPCCPs to ensure that potential contamination of surface water from Project construction activities is minimized.

Lower Coos Bay, within the Project area, is listed on the Oregon 303(d) list as water quality limited for fecal coliform. The ODEQ is in the process of developing TMDLs for watersheds and subbasins in Oregon. TMDLs describe the amount of each pollutant a waterway can receive and still not violate water quality standards. Construction of the slip, access channel, and pipeline and operation of the LNG terminal would comply with COE 404, ODSL Removal-Fill, and NPDES permit conditions. Sanitary waste would be collected in an on-site holding tank and removed by a sanitary waste contractor. There would be no discharge of sanitary waste to Coos Bay.

Development of the North Spit Barge Slip at Southport Forest Products would likely have similar impacts to those of the slip. Because both projects would be required to meet all regulatory and permit conditions, the cumulative effects to the environment would be short term and minimal. There would likely be a cumulative increase in vessel traffic associated with the LNG terminal and the improved North Spit Barge Facility.

Wetlands

Construction and operation of the slip and access channel would result in the permanent loss of approximately 4.15 acres of intertidal habitat, 7.1 acres of shallow subtidal habitat, and 39.5 acres of deep subtidal habitat. Included among the subtidal habitat affected would be approximately 6.8 acres of submerged aquatic vegetation. The Port has proposed mitigation to offset the permanent impact to wetlands that would result from construction and operation of the slip and access channel. To mitigate for loss of intertidal unvegetated sand-mud flats and algal flat, the Port proposes to restore and enhance approximately 30.7 acres of low and/or high marsh.

Construction and operation of the Jordan Cove LNG terminal facilities would not directly affect wetlands. During construction, Jordan Cove would implement erosion and sediment control measures from its Plan and Procedures, which would prevent impact to wetlands not directly affected by facility construction.

Construction and operation of the Pacific Connector pipeline would result in the permanent filling of 0.14 acre of wetlands. Following construction, vegetation maintenance within the permanent operational right-of-way for the pipeline would convert forested or scrub-shrub wetlands to a different wetland type. Permanent wetland vegetation conversion would occur in

approximately 1.1 acre of palustrine forested wetlands and 0.1 acre of palustrine scrub-shrub wetlands. The total permanent wetland vegetation type conversion would be approximately 1.2 acres. In order to minimize impacts to wetlands, Pacific Connector would implement the wetland construction and restoration measures contained in its ECRP.

Pacific Connector has identified proposed compensatory mitigation for the 0.14 acre of permanent wetland impacts associated with fill at two wetlands. Pacific Connector proposes to provide compensatory mitigation by acquiring credits in a mitigation bank (i.e., Cow Hollow) or by applying other COE- and ODSL-approved compensatory mitigation methodologies. Pacific Connector also proposes to acquire credits in the Cow Hollow Mitigation Bank to compensate for permanent conversion of 1.2 acres of forested and scrub-shrub wetland to emergent wetland. With implementation of the proposed mitigation, wetland impacts for the Project would be minor, and would not be expected to contribute to cumulative impacts to wetlands within the affected watersheds.

4.13.2.4 Vegetation and Timber

Past land uses within watersheds affected by the proposed Project facilities have had negative effects on vegetation. In most watersheds, past forest harvest, mining, and livestock grazing have led to extensive land clearing. Noxious weeds have proliferated in some watersheds. Tree diseases have become established in some watersheds as well.

Construction of the LNG terminal facilities would permanently impact approximately 36.1 acres of dune forest that is dominated by shore pine, Sitka spruce, and Douglas-fir, and includes 2.7 acres of the Port-Orford-cedar/evergreen huckleberry association. Construction of the terminal would also permanently affect 3.1 acres of woodland association composed of shore pine/hairy manzanita and shore pine/Douglas-fir associations, and approximately 14.8 acres of herbaceous associations. Construct of the slip and access channel would result in the permanent loss of approximately 22 acres of dune forest and 19.1 acres of disturbed herbaceous habitat. Mitigation for the loss of vegetation would be accomplished through out-of-kind, off-proximity habitat enhancement or protection to achieve the habitat replacement ratios acceptable to ODFW in terms of quantity and quality.

Long-term effects from construction of the pipeline would result from clearing 1275.2 acres of regenerating coniferous forest, 1052.9 acres of coniferous forest, 360.9 acres of mixed forests, 142.6 acres of deciduous forest, and 4.2 acres of forested wetlands. A total of 280.6 acres of vegetation would be periodically mowed and maintained in a shrub or herbaceous state within the permanent easement (a 30-foot maintenance corridor). This removal would contribute to the cumulative effects to vegetation by past, ongoing, and foreseeable actions by land management agencies and public activities on private lands. Construction and operation of the Pacific Connector pipeline would have a cumulative impact on the removal of trees that may contribute to snag and down wood habitat in the future. Table 4.13.1-2 shows that Project-related impacts range from less than 0.01 percent to just over 1 percent of the affected watersheds; therefore, we would not expect project impacts due to vegetation and timber disturbance to be cumulatively significant. Further, the proposed mitigation measures would minimize the cumulative impacts to vegetation to the extent possible.

To avoid a cumulative impact to the introduction or spreading of invasive species, Jordan Cove would follow the recommendations outlined in Oregon Aquatic Species Management Plan, the Oregon Noxious Weed Strategic Plan, and BLM's multi state environmental impacts statement, Northwest Area Noxious Weed Control Program, and its supplements, in addition to the mitigation measures described within section 4.4.2. Pacific Connector would develop and implement a Noxious Weed Control Plan during pipeline construction and operation activities.

4.13.2.5 Wildlife and Aquatic Resources

Wildlife

Past land uses within watersheds affected by the proposed Project facilities have likely had negative effects on wildlife. In the Project area, past forest harvests, mining, and livestock grazing have led to extensive land clearing with concomitant habitat alteration, elimination, or degradation. Such indirect impact to wildlife is a likely consequence of most human-related land uses and would include impact by the proposed LNG terminal and pipeline.

Any increase in local traffic volume due to Project construction and operation has the potential to contribute to cumulative direct impacts. Additional indirect effects to wildlife habitat by future infestations of noxious weeds and forest disease could potentially result from pipeline construction. Measures to prevent noxious weed infestations are discussed in Section 4.4 and would be further detailed in a Noxious Weed Control Plan as part of the ECRP that would be developed prior to construction based on consultations with the ODA, BLM and the USFS.

The BLM and USFS have identified multiple, ongoing, and reasonably foreseeable future actions within the watersheds that also would be affected by the pipeline. Those activities have affected and will continue to affect wildlife. However, silvicultural actions, such as density management projects, are expected to improve dispersal and late-successional habitat conditions in these areas. Furthermore, treatments, such as density management or hardwood conversion to restore large conifers to Riparian Reserves, would also improve habitat conditions in the long term and would function to minimize potential cumulative watershed habitat impacts.

Construction of Pacific Connector pipeline would require removal of wildlife habitats of the types and amounts estimated in section 4.5.3, including the creation of an estimated 76.41 miles of edge through contiguous forest and woodland vegetation types. This estimate does not include removal of trees in clearcut or regenerating forest or woodland, nor does it include both sides of the proposed construction right-of-way. Edges would similarly be created through contiguous sagebrush steppe (9.32 miles), grasslands (11.24 miles west of Cascades, 1.16 miles east of Cascades), and palustrine forested and/or shrub wetlands (0.52 mile). Because the pipeline is linear, the created patch associated with the new edge would be narrow and elongated unlike edges created by forest practices (Forman and Godron 1986). Habitat fragmentation has already occurred to some extent in the are of the proposed Pacific Connector pipeline as a result of residential and rural residential developments, tree harvests, highways, roads, and utility corridors. These sources of cumulative impact to wildlife are expected to increase in the foreseeable future. That removal would add to the effects to wildlife and habitats by past, ongoing, and foreseeable actions by land management agencies and public activities on private lands.

Following construction of the LNG terminal and pipeline, habitat and ecosystem function would be restored in place, where possible, and where not possible, mitigation in various forms would occur. Permanent impacts on aquatic and terrestrial resources would be mitigated by restoring habitat with similar ecological function. As part of its Compensatory Mitigation Plans, Jordan Cove and Pacific Connector propose to preserve or restore habitat in Coos Bay and along the pipeline route. The proposed mitigation measures would minimize the cumulative impacts to wildlife that could result from the Project construction and operation, minimizing the Project contribution to cumulative effects. Consequently, we identified a clear but insignificant cumulative impact to wildlife resources.

Aquatic Resources

The potential for LNG carrier strikes on marine mammals and sea turtles in the waterway during transit to and from the proposed LNG terminal is low, given the speed of the LNG carriers and historical records indicating that vessel strikes of marine animals rarely occur. Additionally, Jordan Cove would implement measures to minimize potential ship strikes to marine mammals and sea turtles. Thus, cumulative impacts to marine mammals and sea turtles are not anticipated.

The primary cumulative impact associated with dredging for the slip and access channel construction is turbidity; however, turbidity impacts would be of a short duration and would not be expected to overlap spatially with the other projects identified in table 4.13.1-1. That is, the turbidity plumes associated with dredging would not likely be additive. Consequently, turbidity impacts are cumulative only in the sense that a single body of water would incur these impacts. Given the volume and dynamic nature of Coos Bay, we would not expect water quality impacts to be cumulatively significant.

Past land uses within watersheds crossed by the Pacific Connector pipeline have had negative effects on fisheries resources and aquatic habitats. Many in-stream habitats have been degraded by loss of gravel and cobble substrates, loss and degradation of pools, depletion of LWD in streams, and loss of potential LWD recruitment. Salmonid spawning and juvenile rearing habitats have been adversely affected as a consequence.

In watersheds that have been analyzed by the BLM and/or USFS, as required by the Aquatic Conservation Strategy, road densities in most watersheds exceed 4 miles of road per square mile. Road construction within Riparian Reserves has been extensive. Changes in forest stand structure and road densities have led to discharge and sedimentation directly into stream networks and have directly affected peak flows. Rain-on-snow events within transient snow zones (elevations between 2,000 and 5,000 feet) have led to extreme runoff and flooding, which has further damaged aquatic habitats.

The watershed conditions from the past actions are expected to improve over the long term because of current management direction and practices outlined in the current land and resource management plans, standards and guidelines, and BMPs that apply to all management actions on federal lands. Forest practices on private timber lands are subject to ODF regulations designed to protect water quality and fish and wildlife habitats. Further, watershed associations have been formed throughout the Project area to accomplish watershed restoration activities to achieve long-term sustainable watershed health. Therefore, it is expected that the reasonably foreseeable silvicultural actions or management treatments that may occur within the watersheds crossed by

the Pacific Connector pipeline would not cause measurable cumulative effects to aquatic species or habitats.

Approximately 95 acres within riparian zones would be affected by clearing the construction right-of-way and TEWAs for the Pacific Connector pipeline, including more than 79 acres within Riparian Reserves on federal lands (table 4.5.2.3-5). Less than half of all affected Riparian Reserves are non-forested due to natural variation of vegetation (9.72 acres) and alteration from human use (8.35 acres). Removal of the remaining 61 acres of forested, regenerating clearcut, and wetland habitats in Riparian Reserves (by clearing the construction right-of-way and TEWAs) would cumulatively impact anadromous and resident fisheries in streams associated with those Riparian Reserves.

Likewise, removal of 17.79 acres of forested habitat on state and private lands would cumulatively impact riparian zones on those lands. Proportionately, there has been more cumulative impact within riparian areas on non-federal lands (crossed by the pipeline) by forest practices, agriculture, and other alterations than on federal lands (table 4.5.2.3-5).

Vegetation removal could result in cumulative impacts to shade, water temperature, nutrient input as detritus, and recruitment of LWD. Construction across waterbodies, primarily by dry open cut methods, would lead to some temporary increase in turbidity. Construction also would disturb existing stream substrates. Project design and mitigation measures proposed by Pacific Connector would reduce or eliminate potential cumulative impacts to most aquatic resources through impact avoidance, minimization, and habitat restoration and enhancement.

Table 4.13.2-1 shows that Project-related impacts range from less than 0.01 percent to just over 1 percent of the affected watersheds. Therefore, we would not expect measurable cumulative impacts to aquatic resources.

4.13.2.6 Land, Recreation, and Visual Resources

Land Use

Past land use activities within the watersheds that would be affected by the Project have altered or converted land uses in the Project area. For example, extensive land development activities including industrial and residential development along with agricultural, mining, past forest clearing, road building, and livestock grazing have converted forest and rangelands to other land uses. Construction of the Project would have cumulative effects where the Project occurs with the other identified reasonably foreseeable projects in the watershed. The disturbance would be made in addition to the cumulative effects to land uses by past and ongoing actions by land management agencies and public activities on private lands. Table 4.13.1-1 provides a list of all other identified projects that may reasonably occur. Implementation of the other silvicultural actions identified in the watersheds would not be considered a cumulative impact to land use because they are forest land use projects and their implementation would not convert or alter the designated future use of these areas. To minimize impacts to forest land uses from the Pacific Connector pipeline and associated facilities, all disturbed forest areas would be reforested, except for the 30-foot pipeline operational right-of-way, according to BLM and USFS requirements on federal lands and ODF on private lands.

While installation of new pipelines in an existing corridor would incrementally reduce the area available for certain future developments, use of established utility corridors concentrates cumulative land use impacts. The pipeline would be co-located with an estimated 90.70 miles of road, powerline, or pipeline rights-of-way.

Recreation

Recreation use occurs throughout the watersheds that would be affected by the Project at all times of the year and is primarily focused along roads. Therefore, cumulative impacts from activities (traffic, noise, disturbance, etc.) would result where the proposed Project activities and other actions, which have been identified by the agencies, occur within the same watershed and at the same time.

With the exception of the Coos Bay estuary, no focused recreation or special interest areas on non-federal lands would be crossed or directly affected by the Pacific Connector pipeline. Impacts to recreation activities would most likely occur temporarily during pipeline construction from increased traffic on local roadways because most recreational activities (walking/hiking, bicycling, driving for pleasure on highways, including driving OHVs) may use the same travel routes as the pipeline construction traffic. Because the proposed pipeline schedule does not include winter construction (except for specific areas within the Klamath Basin to minimize impacts to agricultural areas), cumulative impacts to snowmobile use or other winter recreational activities are not expected.

During pipeline operations, the cleared pipeline right-of-way could be utilized by recreational users, including hikers, equestrians, and mountain bikers, especially where the corridor crosses existing roads and is easily visible and accessible. Although motorized travel would be discouraged by debris barricades, other users may access the corridor and utilize it to connect with other roads and trails. This use would probably be more local in nature, by those who live nearby and are familiar with the existing road and trail network. In the higher elevations during the winter months, the pipeline corridor may be used by cross country skiers and possibly snowmobilers, depending on the effectiveness of the debris barricades. Therefore, cumulative impacts resulting from these types of access and use may result where other actions provide similar access in the same areas.

Marine Traffic

The Port of Coos Bay includes six marine terminals with seven deep-draft berths and a variety of barge facilities. Existing commercial traffic along the Coos Bay navigation channel to and from these facilities includes large cargo ships primarily exporting wood chips. Commercial deep draft cargo traffic has declined from about 300 ships per year 20 years ago to less than 50 today, and the Port expects it to remain at this level (ECONorthwest 2006).

In 2006 the ODFW (2007) counted 71 commercial fishing vessels home ported at Coos Bay, that concentrated on groundfish. There are a total of 537 slips available within the inner and outer basins of the Charleston Marina. Of these, 278 slips can accommodate trollers and trawlers larger than 24 feet in length (Dyer Partnership 2007). The OSMB (2005) counted 30,996 recreational boat trips in Coos Bay in 2004, with 88 percent of those trips related to fishing.

Jordan Cove stated that up to 80 LNG carriers per year could come to call at its import terminal in Coos Bay.

Boats using the waterway may be delayed up to 30 minutes waiting for the passage of an LNG carrier. Boats in Charleston Marina ready to head out to sea may have to wait about 20 minutes for an LNG carrier to pass before entering the channel. Based on a total of 80 LNG carriers visiting the proposed terminal each year, Jordan Cove estimates that LNG marine traffic in the waterway could potentially impact recreational and other boating activity during about 1.3 percent of annual daylight hours (ECONorthwest 2006). Delays related to LNG carrier traffic would occur on average once every 4.5 days. These delays would be similar to those that occur during the current passage of a deep draft cargo vessel. Therefore, we do not consider the impacts to be cumulatively significant.

Visual Resources

An LNG carrier would cross through the viewshed along the waterway in a few minutes, similar to other large cargo ships that frequent the bay for the purpose of loading and hauling wood products. The additional 80 LNG vessels crossing the waterway over a few minutes each would result in minor cumulative impacts to visual resources.

Visual impacts of the LNG facility would be minor because views would be screened by landscape, topography, and distance. The facilities would be painted to blend into the backdrop of the sandy soils and dunes of the area. An earthen berm enclosing the LNG onshore facilities would provide an additional visual barrier between the bay and the terminal. Thus, the LNG terminal would result in minor cumulative impacts to visual resources.

No long-term visual impacts would result from construction and operation of the pipeline in agricultural areas. In the mountainous terrain of the Coastal Range, many of the existing landscapes that would be traversed by the pipeline are already heavily impacted by existing timber harvests, including many large clearcuts. Existing scenic integrity in these areas is low, and the presence of the pipeline would not create visual contrasts in these settings. Impacts on visual resources due to the pipeline operation and maintenance would be short-term, based on the cleared and graded right-of-way through existing clearcuts and along existing transmission line rights-of-way.

From much of the Pacific Connector pipeline viewshed, it is anticipated that views of the pipeline facilities would be partially or fully screened by existing trees, landforms, or intervening development. The majority of the proposed pipeline route across federal lands where visual management standards have been established are already modified by past forest resource practices (logging) projects. However, the pipeline would cross eight sensitive visual management areas and three scenic byways.

Potential cumulative impacts to these sensitive visual areas would be minimized by aligning the pipeline perpendicular to the sensitive visual crossings areas (i.e., State Highway 42, Big Elk Road, Pacific Crest Trail, Dead Indian Highway, State Highway 62, and U.S. Highway 97). The perpendicular crossings of the roads and trail would help minimize the visual effects of the pipeline corridor because, in most cases, traveling observers would be exposed to the right-of-way for only a short length of time as they traveled past it. To further minimize potential visual effects, the construction right-of-way would be reduced in width to 75 feet and any required TEWAs would be

set back from these road crossings to minimize clearing and associated impacts where feasible (i.e., Big Elk Road, Pacific Crest Trail, and Dead Indian Highway). HDDs have been included in the pipeline design at the crossings of the scenic byways (i.e., State Highway 62 and U.S. Highway 97) that parallel the Rogue and Klamath Rivers, and would avoid or significantly minimize the construction disturbance at or adjacent to these crossings. These crossings would also be located in areas of low to moderate visual sensitivity because of existing rural, industrial, or agricultural development. The crossing of State Highway 42 was also selected because it is located in previously disturbed areas associated with highway right-of-way work areas.

In these areas of sensitive viewsheds, Pacific Connector sought a placement for the corridor that would cause the least potential impact and contrast to the existing landscape. Also, where the Clover Creek alignment alternative was incorporated into the preferred route to avoid Buck Lake, the alignment was offset from Clover Creek Road to allow a visual tree screening between the road and the pipeline right-of-way to minimize impacts to sensitive viewsheds.

4.13.2.7 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the Project area. Employment, housing, infrastructure, and public services could experience both beneficial and detrimental impacts.

It is expected that the workforces for the Jordan Cove and Pacific Connector facilities would overlap. The workforces for these activities may place demands on local infrastructure (i.e., temporary housing, other services) because a number of the skilled workforce may temporarily relocate to the Project area. Although the workforces of the other forest practices projects identified by the BLM and USFS within the watersheds crossed by the pipeline may overlap for a period of several weeks, cumulative impacts associated with these workforce overlaps are not expected. Cumulative impacts from the forest practice projects are not expected to place demands on local infrastructures because the workforces for these projects are expected to come from the local communities. Additionally, increased population impacts as a result of the pipeline would be temporary and dispersed due to the linear characteristic of the pipeline.

The potential for the maximum cumulative workforce is expected to occur in Coos County where the LNG terminal and the Coos Bay segment of the pipeline would be constructed. This Project area would have the highest demand on local infrastructures. This area is also a seasonal recreational and tourism destination because of the opportunities to fish, boat, operate OHVs, as well as take part in other coastal activities. The Project area is also served by U.S. Highway 101, which is the only coastal travel artery along the Oregon Coast; therefore, demand on local infrastructures is expected to occur during the summer months. Although these conditions may create a short-term demand on temporary housing for non-local workers, this potential impact is expected to be insignificant.

Beneficial cumulative effects of the Project include increased job opportunities through employment of construction contractors, revenue from purchases of local materials, and increased expenditures in the local communities. No significant cumulative long-term impacts to employment and demands on local services are expected.

The majority of the pipeline work areas are rural, with access from state highways, I-5, and various county roads. These roads, as well as other local and forest roads, would be used to move construction equipment, materials, and personnel to the construction right-of-way from the various contractor and pipe storage yards, as well as from the residential centers in the four counties where the pipeline construction personnel would reside. Potential traffic impacts of the pipeline could potentially result in short-term, cumulative impacts on the transportation network where multiple projects are being constructed simultaneously.

Cumulative traffic impacts could be expected in Coos County where construction traffic for the LNG terminal, access channel and slip, and pipeline activities occur on the North Spit. Access to the North Spit construction sites is provided by U.S. Highway 101 and by the Trans-Pacific Parkway. Cumulative traffic impacts from the Project is expected to be minor and short term. Traffic for construction of the pipeline component of the Project in the vicinity of the North Spit for installation of the pipeline across the Coos Bay estuary would primarily occur between October and mid-February, outside the summer months. Furthermore, traffic impacts would be mitigated by implementing a worker transportation program (i.e., busing multiple workers to the LNG construction site). Jordan Cove has conducted a traffic survey that provided various recommendations to ensure that the roads and intersections in the LNG terminal and slip site areas remain at an acceptable level. Jordan Cove would review these recommendations with ODOT prior to construction.

Cumulative traffic impacts from construction of the Project along with traffic associated with the other projects that have been identified in the watersheds crossed by the pipeline are expected to be short term and localized, such as to specific forest roads that these projects may utilize. The traffic associated with these other, primarily silvicultural, actions are expected to be minor and short term because of their small workforce requirements. Typically these projects only require a few round trips per day over several weeks or months to complete. However, where timber haul routes for these projects overlap with proposed access routes for the pipeline, cumulative traffic impacts may occur and cause delays or other traffic inconveniences.

Pacific Connector would minimize cumulative traffic impacts by requiring contractors to bus laborers, operators, and other non-supervisory personnel to specific job sites along the right-of-way. Traffic control plans would also be developed, where necessary, for specific locations along the pipeline through consultation with ODOT to ensure public safety.

4.13.2.8 Cultural Resources

Past disturbances to cultural resources sites in the Project area have been related to legal collecting; accidental disturbance; intentional destruction or vandalism; and construction and maintenance operations associated with existing infrastructure (roads, railroads, and transmission lines). The currently proposed projects listed in table 4.13.1-1 that are defined as federal actions would include mitigation measures designed to avoid or minimize additional direct impacts on cultural resources. Where direct impacts on significant cultural resources are unavoidable, mitigation (e.g., recovery and curation of materials) would occur before construction. Non-federal actions would need to comply with any mitigation measures required by the state. Increased access by rights-of-way and service roads would increase the potential for trespass or vandalism at previously inaccessible sites. The proposed Project would only incrementally add

to the effects of the other projects and result in less than significant cumulative impacts on cultural resources in the area.

4.13.2.9 Air Quality

Emissions from the marine vessel traffic would be periodic and transient, and they are not expected to result in significant long-term air quality impacts, although there could be short-term localized impacts. LNG carriers transporting the LNG are typically oil-fired or dual-fueled. To minimize emissions while docked, Jordan Cove has committed to using only LNG carriers that are capable of “cold-ironing” (i.e., those that can use electrical power from land, rather than using their own engines to generate electricity). As described in Section 4.11, it is estimated that annual LNG vessel traffic (including tugboats) would produce 5.3 tons of PM₁₀, 104.6 tons of SO₂, 156.4 tons of NO_x, 17.6 tons of CO, and <6.3 tons of VOCs. Similarly, annual greenhouse gas emissions were estimated to be <14,532 tons of CO₂, <2.0 tons of CH₄, and <0.1 tons of N₂O. These emissions would cumulatively impact the air quality with other emission sources in the area, including other large vessel traffic that is estimated to be about 50 ships per year.

Cumulative fugitive dust (particulate) increases may occur where construction of the Pacific Connector pipeline would occur with other hauling activities associated with silvicultural actions that are identified in table 4.13.1-1 where these projects are using the same access road systems at the same time. Cumulative effects may occur in 2010 and 2011 when the pipeline construction is scheduled. Construction activities could overlap with other silvicultural projects’ hauling requirements. However, most of the reasonably foreseeable projects listed for the various watersheds would be completed prior to the Pacific Connector work commencing. It is expected that cumulative impacts would be brief and would be mitigated by compliance with land managers’ requirements for dust control on roads and excavated surfaces.

The Pacific Connector component of the Project would include a new emissions source, a natural gas turbine at the Butte Falls Compressor Station. As a consequence, the Pacific Connector pipeline would directly contribute to hydrocarbon emissions from this facility; however, the emissions would be permitted under the CAA through ODEQ and would not exceed air quality standards to minimize potential cumulative impacts to the airsheds.

4.13.3 Cumulative Impact Conclusions

We conclude that construction of the projects listed in table 4.13.1-1, especially if they are constructed on an overlapping timeline with the proposed JCE & PCGP Project, has the potential to contribute cumulative impacts on the Project area. Each of the projects considered would result in temporary and minor effects during construction, but each project would be designed to avoid or minimize impacts on water quality, forest and marine resources, and wildlife. Additionally, significant impacts on sensitive resources resulting from these projects would be mitigated, as appropriate, and mitigation generally leads to the avoidance or minimization of cumulative impacts.

We recognize that unanticipated accidents during construction or operation could result in potential undefined impacts. However, a meaningful evaluation of those potential impacts is impossible, as quantification of potential impacts would be speculative at best. Accordingly, we consider project monitoring and mitigation programs to be critical in addressing unanticipated

impacts, should they occur. With the Project's proposed construction and operation methods, and strict adherence to our recommendations for additional mitigation made in this EIS, federal and state regulations, and permitting requirements, impacts associated with the proposed Project would be minimized, and would not constitute a significant impact in combination with other past, present, or reasonably foreseeable projects.