Appendix A

Plan Contributors

Plan Contributors

Name	Region	Affiliation	Address	Phone	Email
Roxanne Bash	WFL	FLH LRTP Project Manager	610 E. 5th Street, Vancouver, WA 98661	360-619-7558	roxanne.bash@dot.gov
Dave Brown	WFL	FLH Refuge Road Program Coordinator - Retired	610 E. 5th Street, Vancouver, WA 98661		
Nathan Caldwell	National	National Alternative Trasnsportation Coordinator	4401 N. Fairfax Drive, MS 634, Arlington, VA 22203	730-358-2205	nathan_caldwell@fws.gov
Dave Drescher	Region 1	FWS Refuge Information Branch Chief	911 NE 11th Avenue, Portland, OR 97232	503-231-6161	david_drescher@fws.gov
Pete Field	WFL	FLH Transportation Planner	610 E. 5th Street, Vancouver, WA 98661	360-619-7619	peter.field@dot.gov
Bob Flores	Region 1	Ridgefield NWR Complex	29808 NW Main Avenue, Ridgefield, WA 98642	360-887-4106	bob_flores@fws.gov
Sean Furniss	National	National Refuge Road Program Coordinator - Retired	4401 N. Fairfax Drive, MS 634, Arlington, VA 22203		
Steve Suder	National	National Refuge Road Program Coordinator	4402 N. Fairfax Drive, MS 634, Arlington, VA 22203	703-358-1752	Steve_Suder@fws.gov
Paul Hayduk	Region 1	Facility Operations Coordinator	911 NE 11th Avenue, Portland, OR 97232	503-7364780	paul_hayduk@fws.gov
Elijah Henley	CFL	FLH Transportation Planner	12300 W. Dakota Avenue, Lakewood, CO 80228	720-963-3562	elijah.henley@dot.gov
Jeff Holm	Region 1	FWS LRTP Project Manager	911 NE 11th Avenue, Portland, OR 97232	503-231-2161	jeff_holm@fws.gov
Susan Law	WFL	FLH Alternative Transportation Planner	610 E. 5th Street, Vancouver, WA 98661	360-619-7840	susan.law@dot.gov
Chris Jaeschke	EFL	FLH Transportation Planner	21400 Ridgetop Circle, Sterling, VA 20166	703-404-6306	christoph.jaeschke@dot.gov
Brandon Jutz	Region 3	FWS Transportation Coordinator	1 Federal Drive, Ft. Snelling, MN 55111	612-713-5407	brandon_jutz@fws.gov
Kirk Lambert	Region 1	FWS Asset Management Coordinator	911 NE 11th Avenue, Portland, OR 97232	503-231-2078	Kirk_Lambert@fws.gov
Mike Marxen	Region 1	Chief, Visitor Services and Communications	911 NE 11th Avenue, Portland, OR 97232	503-872-2700	mike_marxen@fws.gov
Larry Marchant	Region 1	Project Leader Spring Creek National Fish Hatchery - Retired	16552 State Road 14, Underwood, WA 98651		
Alex Schwartz	Region 1	FWS Landscape Architect	2600 S.E. 98th Avenue, Suite 100, Portland, OR 97266	503-231-6179	alex_schwartz@fws_gov

Appendix B

Region 1 Refuges and Hatcheries

Region 1 Refuges and Hatcheries

Station	Headquarters/Complex	State/Territory
Abernathy Fish Technology Center	Abernathy Fish Technology Center	WA
Ankeny NWR	Willamette Valley NWR Complex	OR
Baker Island NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Bandon Marsh NWR	Oregon Coast NWR Complex	OR
Baskett Slough NWR	Willamette Valley NWR Complex	OR
Bear Lake NWR	Southeast Idaho NWR Complex	ID
Big Canyon NFH	Lower Snake River Compensation Plan	OR
Camas NWR	Southeast Idaho NWR Complex	ID
Cape Meares NWR	Oregon Coast NWR Complex	OR
Captain John Rapids NFH	Lower Snake River Compensation Plan	WA
Carson NFH	Carson NFH Complex	WA
Clearwater NFH	Lower Snake River Compensation Plan	ID
Cold Springs NWR	Mid-Columbia River NWR Complex	OR
Columbia NWR	Mid-Columbia River NWR Complex	WA
Conboy Lake NWR	Mid-Columbia River NWR Complex	WA
Copalis NWR	Washington Maritime Complex	WA
Cottonwood Creek NFH	Lower Snake River Compensation Plan	WA
Crooked River NFH	Lower Snake River Compensation Plan	ID
Curl Lake NFH	Lower Snake River Compensation Plan	WA
Deer Flat NWR	Deer Flat NWR	ID
Dungeness NWR	Washington Maritime Complex	WA
Dworshak NFH	Dworshak National Fish Hatchery Complex	ID
Eagle Creek NFH	Eagle Creek NFH Complex	OR
Eagle Fish Health Laboratory	Lower Snake River Compensation Plan	ID
East Fork Salmon NFH	Lower Snake River Compensation Plan	ID
Entiat NFH	Leavenworth National Fish Hatchery Complex	WA
Flattery Rocks NWR	Washington Maritime Complex	WA
Franz Lake NWR	Ridgefield National Wildlife Refuge Complex	WA
Grays Harbor NWR	Nisqually NWR Complex	WA
Grays Lake NWR	Southeast Idaho NWR Complex	ID
Guam NWR	Hawaiian and Pacific Islands NWR Complex	Guam
Hagerman NFH	Hagerman National Fish Hatchery Complex	ID
Hakalau Forest NWR	Big Island NWR Complex	HI
Hanalei NWR	Kauai NWR Complex	HI

Station	Headquarters/Complex	State/Territory
Hanford Reach National Monument	Mid-Columbia River NWR Complex	WA
Hart Mountain National Antelope Refuge	Sheldon-Hart Mountain NWR Complex	OR
Hawaiian Islands NWR	Hawaiian and Pacific Islands NWR Complex	HI
Howland Island NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Huleia NWR	Kauai NWR Complex	HI
Idaho Fish Health Center	Dworshak National Fish Hatchery Complex	ID
Imnaha NFH	Lower Snake River Compensation Plan	OR
Inland Northwest NWR Complex	Inland Northwest NWR Complex	WA
Irrigon NFH	Lower Snake River Compensation Plan	OR
James Campbell NWR	Oahu NWR Complex	HI
Jarvis Island NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Johnston Island NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Julia Butler Hansen Refuge	Willapa National Wildlife Refuge Complex	WA
Kakahaia NWR	Maui NWR Complex	HI
Kauai NWR Complex	Hawaiian and Pacific Islands NWR Complex	HI
Kealia Pond NWR	Maui NWR Complex	HI
Kilauea Point NWR	Kauai NWR Complex	HI
Kingman Reef NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Kona Forest NWR	Big Island NWR Complex	HI
Kooskia NFH	Dworshak National Fish Hatchery Complex	ID
Kootenai NWR	Inland Northwest NWR Complex	ID
Leavenworth NFH	Leavenworth National Fish Hatchery Complex	WA
Lewis and Clark NWR	Willapa National Wildlife Refuge Complex	WA
Little Pend Oreille NWR	Inland Northwest NWR Complex	WA
Little Sheep Creek	Lower Snake River Compensation Plan	OR
Little White Salmon NFH	Little White Salmon National Fish Hatchery Complex	WA
Lookingglass NFH	Lower Snake River Compensation Plan	OR
Lower Columbia River Fish Health Center	Little White Salmon National Fish Hatchery Complex	WA
Lower Snake River Compensation Plan	Lower Snake River Compensation Plan	ID
Lyons Ferry NFH	Lower Snake River Compensation Plan	WA
Magic Valley NFH	Lower Snake River Compensation Plan	ID
Makah NFH	Makah NFH	WA

Station	Headquarters/Complex	State/Territory
Malheur NWR	Malheur NWR	OR
McCall NFH	Lower Snake River Compensation Plan	ID
McKay Creek NWR	Mid-Columbia River NWR Complex	OR
McNary NWR	Mid-Columbia River NWR Complex	WA
Midway Atoll NWR	Papahanaumokuakea Marine National Monument	Pacific Outlying Islands
Minidoka NWR	Southeast Idaho NWR Complex	ID
Nestucca Bay NWR	Oregon Coast NWR Complex	OR
Nisqually NWR	Nisqually NWR Complex	WA
Nisqually NWR Complex	Nisqually NWR Complex	WA
Oahu Forest NWR	Oahu NWR Complex	HI
Olympia Fish Health Center	Olympia Fish Health Center	WA
Oregon Coast NWR Complex	Oregon Coast NWR Complex	OR
Oregon Islands NWR	Oregon Coast NWR Complex	OR
Oxford Slough WPA	Southeast Idaho NWR Complex	ID
Pacific Reefs NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Palmyra Atoll NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Pearl Harbor NWR	Oahu NWR Complex	HI
Pierce NWR	Ridgefield National Wildlife Refuge Complex	WA
Protection Island NWR	Washington Maritime Complex	WA
Quilcene NFH	Quilcene NFH	WA
Quillayute Needles NWR	Washington Maritime Complex	WA
Quinault NFH	Quinault NFH	WA
Red River NFH	Lower Snake River Compensation Plan	ID
Ridgefield NWR	Ridgefield National Wildlife Refuge Complex	WA
Rose Atoll NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
San Juan Islands NWR	Washington Maritime Complex	WA
Sawtooth NFH	Lower Snake River Compensation Plan	ID
Sheldon NWR	Sheldon-Hart Mountain NWR Complex	NV
Siletz Bay NWR	Oregon Coast NWR Complex	OR
South Fork NFH	Lower Snake River Compensation Plan	ID
Southeast Idaho NWR Complex	Southeast Idaho NWR Complex	ID
Spring Creek NFH	Spring Creek NFH	WA
Steigerwald Lake NWR	Ridgefield National Wildlife Refuge Complex	WA

Station	Headquarters/Complex	State/Territory
Three Arch Rocks NWR	Oregon Coast NWR Complex	OR
Toppenish NWR	Mid-Columbia River NWR Complex	WA
Tualatin River NWR	Tualatin River NWR	OR
Tucannon NFH	Lower Snake River Compensation Plan	WA
Turnbull NWR	Inland Northwest NWR Complex	WA
Umatilla NWR	Mid-Columbia River NWR Complex	WA
Wake Atoll NWR	Pacific Remote Islands NWR Complex	Pacific Outlying Islands
Wallowa NFH	Lower Snake River Compensation Plan	OR
Warm Springs NFH	Warm Springs NFH Complex	OR
Washington Maritime NWR Complex	Washington Maritime NWR Complex	WA
Willamette Valley NWR Complex	Willamette Valley NWR Complex	OR
Willapa NWR	Willapa National Wildlife Refuge Complex	WA
Willard NFH	Little White Salmon National Fish Hatchery Complex	WA
William L. Finley NWR	Willamette Valley NWR Complex	OR
Winthrop NFH	Leavenworth National Fish Hatchery Complex	WA

Appendix C

Data Sources

Data Sources and Analysis

Baseline conditions are established for a number of factors including physical characteristics like condition and asset type as well as external factors such as value, visitation, population, sensitivity to/from climate change, safety, and non-service partnership opportunities. Understanding of these factors is achieved by synthesizing various datasets and establishing a baseline condition. The Data Sources and Analysis appendix documents the data and processes used to synthesize information used in the baseline condition analysis.

Data Sources Overview

Information used to establish baseline conditions is mined from regularly updated Service data sources like the Service Asset Maintenance Management System (SAMMS) and the Road Inventory Program (RIP). SAMMS provides information on facility and equipment deficiencies, justifies budget requests for maintenance needs, and provides a sound basis for management decision-making. RIP data contains a condition assessment of all Service roads, parking lots, and trails. The dataset is updated in regular five year periods.

Supplemental information from non-Service sources is also used to establish baseline conditions. These sources include the US Census, Federal Highway Administration (FHWA), Federal Transit Administration (FTA), US Geological Survey (USGS), Federal Emergency Management Agency (FEMA), Environmental Systems Research Institute (ESRI), Bureau of Transportation Statistics (BTS), and state departments of transportation (DOT). Table 1. Data SourcesTable 1 indicates commonly used datasets for determining baseline conditions in each goal area.

Table 1. Data Sources

1. Resource Protection	Fatal accidents	NHTSA
2. Conditions and Safety	Asset Conditions (RIP)	FWS/FLH
	API rankings (SAMMS)	FWS
	Facility condition index (SAMMS)	FWS
	Crashes	ID, OR, WA DOTs
	Road pavement condition	OR DOT
	AADT	ID/OR DOTs and NHPN
3. Welcome and Orient	Visitation	FWS
	Population	US Census
	Populated places	US Census
4. Planning	Service planning status	FWS
	State planning boundaries	HI, WA, OR, ID state departments
5. Partnerships	N/A	N/A
6. Sustainability	FWS plans	FWS
	Vulnerability of coastal areas to sea level change	USGS
	Seismic risk	USGS
	Air quality non-attainment areas	BTS
	Transit districts	FTA, BTS, State DOTs, Google

Resource Protection

At this time, resource protection data consists of fatal accident locations caused by animal-vehicle collisions. This data was derived from NHTSA vehicle fatality tables, for 2001 through 2008. Filtering for animal collision deaths (using "HARM_EV" = 11), latitude and longitude values were used to plot, and select based on proximity to FWS boundaries. A spatial join was used to identify the accidents that were located in or near a particular unit.

Safety and Conditions

The Service is committed to providing safe and reliable access to and within its lands and facilities. As such, baseline condition analyses have been established for issues related to access and safety.

Priority, Condition Index, Value, and Condition

Transportation asset conditions, value, priority, and deferred maintenance summaries combine SAMMS, RIP, and GIS data provided by FHWA FLH and FWS. This information is summarized in Table 2 and Table 4. Current replacement value (CRV), asset priority index (API), and facility condition index (FCI) data is aggregated to the unit level. These RIP and SAMMS tables were joined by "asset id" to generate tabular summaries. Because of gaps in "asset ids" in both the RIP and SAMMS datasets, results are incomplete.

For trails, "asset-id" fields were not used, rather records were filtered by trail related keywords (This was done instead of using the SAMMS asset number as a common join field because 30% of trails (by length) in the GIS dataset contain "N/A" values as their asset ID). The remaining information was summed and normalized (by length) for each unit. To verify the completeness or coverage of the SAMMS information, the recorded trail lengths were compared against measured trail lengths generated through the GIS dataset. The outcome of this exercise is represented in the "% Coverage" columns in the final outcome table. A value greater than 100% in this column indicates that the SAMMS table shows a total trail distance that is longer than what was derived from the GIS dataset.

Deferred maintenance could not be summarized using the process described above because the table containing DM values does not list trail lengths. As a result, information could not be weight/averaged or verified for completeness. Instead, and despite the gap in asset IDs, the SAMMS asset number was used to perform a table relate with the GIS dataset. The measured lengths generated through the GIS dataset were then used to weight/average DM information.

Road, Parking, and Trail Conditions

To better understand the composition of roads, parking, and trail condition rankings, it was necessary to aggregate surface type from condition ranking. This information is summarized in Table 5 and Table 6 in addition to the condition summary tables in the Goals and Conditions chapter, *Safety and Condition* section. The result is a table that breaks out the lengths of surface type contained within a condition ranking. For context, this information is supplemented with percentages of: surface type within a particular condition category, percent of a particular condition and surface type that make up the total of Service trails, and total percent condition category of all trail miles – regardless of surface type. The summaries were produced using Access queries of RIP data.

FWS Trail Deficiencies

Trail deficiencies are identified in baseline conditions in tabular form by state, unit, and deficiency classification. Access queries of RIP trail deficiencies data show number and type of deficiencies found in each unit, by state. This data is shown in Table 5.

Non-Service Road Condition, Use, and Safety

The LRTP uses non-service road condition, use, and safety improvement information to help identify areas of need of improvement and possible partnership. To accomplish this, data is required from each Region 1 state's department of transportation.

For Oregon, a GIS was used to identify crash data, use, and AADT for Oregon State Department of Transportation (ODOT) non-Service roads that intersect FWS units. A spatial intersect was preformed between the NHPN dataset and FWS units to find were these roads entered/exited Service boundaries. Spatial joins allowed for the linking of these locations to ODOT crash, condition, and AADT data. Data resulting from these operations were synthesized using Access.

For Washington, crash data was provided as a series of tables which described crash events. Once these tables were compiled into a single table, route name and milepost information was used to create a unique identifier ("Seg-code" + "milepost[rounded]"). Using GIS milepost data available from WDOT's website, the same route name-milepost unique identifier was created. The tabular crash dataset was then able to be joined to the milepost spatial data. AADT data was not available from the state, so this information was derived from the NHPN dataset instead. AADT data was spatially joined to the crash data to facilitate the creation of tabular summaries. The state was not able to provide pavement condition data.

The process of joining crash data with milepost data was repeated for Idaho data. Like Washington, no pavement surface condition data was available; however a 2007 AADT dataset was readably available.

No road condition, use, or safety data was available from Hawaii D

Table 2. Combined SAMMS and RIP Road Data

State	FWS Unit	Route Name	Route ID	Surface	API	FCI	Condition
Hawaii	Hanalei NWR	Cemetery Road	FWS-HANA-100	Asphalt	45	0.1	Failed
		Cemetery Road	FWS-HANA-100	Gravel	65	0.1	Failed
	Kealia Pond NWR	Entrance Road	FWS-KEPO-010	Asphalt	100	0	Fair
	Kilauea Point NWR	Kilauea Lighthouse Road	FWS-KIPO-010	Asphalt	100	0	Fair
Idaho	Bear Lake NWR	Paris Dike Boat Ramp Access	FWS-BELA-102	Gravel	70	0.9	Fair
	Camas NWR	Main Entrance Road	FWS-CAMA-013	Asphalt	70	0	Fair
		Wildlife Viewing Route - Big Pond	FWS-CAMA-010	Gravel	55	0	Good
		Wildlife Viewing Route - Toomey Pond	FWS-CAMA-011	Gravel	65	0	Good
	Deer Flat NWR	Gott's Point Road	FWS-DEFL-100	Gravel	45	0	Fair
		Lower Dam Boat Ramp Access	FWS-DEFL-101	Asphalt	45	0.1	Fair
		Lower Dam Youth Camp Access	FWS-DEFL-102	Gravel	45	0	Fair
		Visitor Center Access	FWS-DEFL-010	Asphalt	70	0.1	Poor
	Grays Lake NWR	Headquarters Auto Tour Road	FWS-GRLA-010	Gravel	55	0	Good
	Kootenai NWR	Auto Tour Route	FWS-KOOT-010	Asphalt	100	0	Fair
		Auto Tour Route	FWS-KOOT-010	Gravel	100	0	Good
	Minidoka NWR	17-mile Hole Road	FWS-MINI-103	Gravel	65	0.3	Failed
		Bird Island Road	FWS-MINI-100	Gravel	80	0.2	Fair
		Gifford Springs Road	FWS-MINI-105	Gravel	65	0	Good
		North Refuge Road 1	FWS-MINI-106	Gravel	65	0	Failed
		North Refuge Road 1	FWS-MINI-106	Gravel	65	0	Poor
		North Refuge Road 2	FWS-MINI-107	Gravel	65	0	Fair
		North Refuge Road 2	FWS-MINI-107	Gravel	65	0	Poor
		North Refuge Road 2	FWS-MINI-107	Gravel	65	0	Failed
		North Refuge Road 3	FWS-MINI-108	Gravel	65	0	Failed
	Oxford Slough WPA	Entrance Road	FWS-OXSL-010	Gravel	80	0	Good
Nevada	Sheldon NWR	34A Road	FWS-SHEL-100	Gravel	80	0	Fair
		34A Road	FWS-SHEL-100	Gravel	80	0	Good
		Badger Road	FWS-SHEL-107	Native	80	0.1	Good
		Big Spring Road	FWS-SHEL-102	Gravel	80	0	Fair
		Big Spring Road	FWS-SHEL-102	Gravel	80	0	Good
		IXL Road	FWS-SHEL-101	Native	65	0.1	Poor
		IXL Road	FWS-SHEL-101	Native	65	0.1	Good
		IXL Road	FWS-SHEL-101	Native	65	0.1	Fair
		Sagebrush Creek Road	FWS-SHEL-104	Gravel	80	0.1	Good
		Virgin Valley Road	FWS-SHEL-103	Gravel	100	0.1	Good
		Virgin Valley Road	FWS-SHEL-103	Native	100	0.1	Good

Table 2. Combined SAMMS and RIP Road Data

State	FWS Unit	Route Name	Route ID	Surface	API	FCI	Condition
Nevada	Sheldon NWR	Virgin Valley Road	FWS-SHEL-103	Native	100	0.1	Failed
		Virgin Valley Road	FWS-SHEL-103	Native	100	0.1	Fair
		Virgin Valley Road	FWS-SHEL-103	Native	100	0.1	Poor
Oregon	Ankeny NWR	Office Road	FWS-ANKE-101	Gravel	100	0.1	Good
		Visitor Kiosk Access	FWS-ANKE-100	Gravel	100	0.4	Excellent
	Bandon Marsh NWR	HQ Access Road	FWS-BAMA-010	Asphalt	80	0	Good
	Baskett Slough NWR	Office Access Road	FWS-BASL-100	Gravel	100	0.8	Excellent
	Cape Meares NWR	Cape Meares Lighthouse Drive	FWS-CAME-100	Asphalt	100	0.1	Poor
	Cold Springs NWR	South Auto Tour Loop	FWS-COSP-100	Gravel	65	0	Good
		South Entrance Road	FWS-COSP-010	Gravel	80	0	Good
		Southeast Boat Launch Access	FWS-COSP-102	Gravel	65	0	Good
	Hart Mountain NWR	Bath House Road	FWS-HAMO-200	Gravel	65	0	Good
		Blue Sky Road	FWS-HAMO-100	Native	80	0	Good
		Blue Sky Road	FWS-HAMO-100	Native	80	0	Fair
		Blue Sky Road	FWS-HAMO-100	Gravel	80	0	Good
		Blue Sky Road	FWS-HAMO-100	Native	80	0	Poor
		Flook Lake Road	FWS-HAMO-012	Native	80	0	Failed
		Frenchglenn Road	FWS-HAMO-011	Native	80	0.1	Good
		Frenchglenn Road	FWS-HAMO-011	Native	80	0.1	Fair
		Hot Springs Campground Road	FWS-HAMO-101	Gravel	65	0	Good
		Main Entrance Road	FWS-HAMO-010	Gravel	80	0	Good
		Petroglyph Lake Road	FWS-HAMO-014	Native	65	0.2	Failed
		Poker Jim Road	FWS-HAMO-015	Native	65	0.2	Failed
		Post Meadows Road	FWS-HAMO-019	Native	65	0.3	Failed
		Warner Pond Road	FWS-HAMO-013	Gravel	65	0.2	Failed
	Malheur NWR	Buena Vista Road	FWS-MALH-108	Gravel	100	0	Failed
		Buena Vista Road	FWS-MALH-108	Gravel	100	0	Fair
		Center Patrol Road North	FWS-MALH-106	Gravel	100	0	Good
		Center Patrol Road North	FWS-MALH-106	Gravel	100	0	Poor
		Center Patrol Road North	FWS-MALH-106	Gravel	100	0	Fair
		Center Patrol Road South	FWS-MALH-102	Gravel	100	0	Fair
		Center Patrol Road South	FWS-MALH-102	Gravel	100	0	Good
		Double O Road	FWS-MALH-110	Gravel	65	0	Poor
		Double O Road	FWS-MALH-110	Gravel	65	0	Good
		Double O Road	FWS-MALH-110	Gravel	65	0	Fair
		Headquarters Entrance Road	FWS-MALH-010	Gravel	100	0	Good
		Krumbo Reservoir Road	FWS-MALH-104	Gravel	100	0	Good
		Tipton Road	FWS-MALH-116	Native	100	0	Failed
	McKay Creek NWR	Entrance Road/Boat Launch Access	FWS-MCCR-010	Asphalt	100	0	Fair
		McKay Resevior Road	FWS-MCCR-100	Asphalt	80	0	Fair
		McKay Resevior Road	FWS-MCCR-100	Gravel	80	0	Fair
		McKay Resevior Road	FWS-MCCR-100	Gravel	80	0	Good

Table 2. Combined SAMMS and RIP Road Data

State	FWS Unit	Route Name	Route ID	Surface	API	FCI	Condition
Oregon	Nestucca Bay NWR	Christensen Road	FWS-NEBA-100	Gravel	100	0	Good
	Tualatin River NWR	Refuge Entrance Road	FWS-TURI-010	Gravel	65	0.6	Good
		Wayside Road	FWS-TURI-100	Gravel	65	0	Excellent
	Umatilla NWR	Auto Tour Route	FWS-UMAT-010	Asphalt	80	0.1	Poor
		Auto Tour Route	FWS-UMAT-010	Gravel	80	0.1	Good
		Heritage Trail Road	FWS-UMAT-101	Gravel	65	0.2	Good
		McCormick North Road	FWS-UMAT-103	Gravel	65	0	Fair
		Paterson Slough South Road	FWS-UMAT-105	Gravel	65	0.1	Good
		Paterson Slough South Road	FWS-UMAT-105	Asphalt	65	0.1	Poor
		Paterson Unit Access Road	FWS-UMAT-104	Gravel	80	0.1	Good
		Paterson Unit Access Road	FWS-UMAT-104	Asphalt	80	0.1	Poor
		Ridge Unit Access Road	FWS-UMAT-106	Gravel	65	0	Good
		Visitor Info Access	FWS-UMAT-100	Gravel	65	0	Fair
		Whitcomb East Spur	FWS-UMAT-109	Gravel	65	0	Good
		Whitcomb Island Road	FWS-UMAT-011	Gravel	65	0.1	Good
		Whitcomb Middle Road	FWS-UMAT-108	Gravel	65	0	Good
		Whitcomb West Spur	FWS-UMAT-107	Gravel	65	0	Fair
	William F. Finley NWR	Bruce Road Overlook Access Road	FWS-WIFI-102	Gravel	55	0	Excellent
		Finley Refuge Road	FWS-WIFI-010	Gravel	100	0.2	Excellent
		Finley Refuge Road	FWS-WIFI-010	Gravel	100	0.2	Good
		Refuge Office Access	FWS-WIFI-100	Gravel	100	1	Good
		Woodpecker Loop Road	FWS-WIFI-101	Gravel	55	0	Good
Washington	Columbia NWR	Black Lake Road	FWS-COIA-106	Gravel	80	0.9	Fair
		Blythe Lake Road	FWS-COIA-103	Gravel	100	0.5	Failed
		Hampton Lake Road	FWS-COIA-107	Gravel	80	0.2	Good
		Hutchinson Lake Road	FWS-COIA-105	Gravel	80	0.3	Poor
		Marsh Unit 1 Access	FWS-COIA-100	Gravel	100	0.3	Good
		Marsh Unit 1 Access	FWS-COIA-100	Gravel	100	0.3	Failed
		Morgan Lake Road	FWS-COIA-010	Gravel	80	0.2	Fair
		Morgan Lake Road	FWS-COIA-010	Gravel	80	0.2	Good
		Pillar/Wigeon Road	FWS-COIA-101	Gravel	100	0.8	Failed
		Pillar/Wigeon Road	FWS-COIA-101	Gravel	100	0.8	Good
		Soda Lake Campground Road	FWS-COIA-102	Gravel	100	0.6	Fair
		Solbeck Road	FWS-COIA-104	Gravel	100	0.4	Good
		Teal Lakes Road	FWS-COIA-011	Gravel	80	0	Fair
		Teal Lakes Road	FWS-COIA-011	Gravel	80	0	Good
	Conboy Lake NWR	Wildlife Refuge Road	FWS-COLA-010	Gravel	70	0	Good

Table 2. Combined SAMMS and RIP Road Data

State	FWS Unit	Route Name	Route ID	Surface	API	FCI	Condition
Washington	Hanford Reach National Monument	Wahluke South Road - South Access	FWS-SAMO-010	Gravel	100	0.1	Good
		WB-10 Road	FWS-SAMO-105	Native	100	0	Poor
		WB-10 Road	FWS-SAMO-105	Asphalt	100	0	Poor
		WB-10 Road	FWS-SAMO-105	Gravel	100	0	Failed
		White Bluffs Ferry Road	FWS-SAMO-104	Gravel	100	0.1	Good
		White Bluffs Ferry Road	FWS-SAMO-104	Asphalt	100	0.1	Poor
	Julia Butler Hanson NWR	Refuge Entrance Road	FWS-JUHA-010	Asphalt	100	0	Fair
	Little Pend Oreille NWR	Bear Creek Road	FWS-LIOR-010	Gravel	100	0.2	Good
		Bear Creek Road	FWS-LIOR-010	Gravel	100	0.2	Fair
		Bear Creek Road	FWS-LIOR-010	Gravel	100	0.2	Failed
		Blacktail Mountain Cutoff Road	FWS-LIOR-105	Gravel	100	0	Good
		Blacktail Mountain Road	FWS-LIOR-014	Gravel	100	0.1	Poor
		Blacktail Mountain Road	FWS-LIOR-014	Gravel	100	0.1	Failed
		Blacktail Mountain Road	FWS-LIOR-014	Gravel	100	0.1	Fair
		Blacktail Mountain Road	FWS-LIOR-014	Gravel	100	0.1	Good
		Cedar Creek Road	FWS-LIOR-107	Gravel	100	0.4	Failed
		Cliff Ridge Road	FWS-LIOR-013	Native	100	0.2	Failed
		Headquarters Access	FWS-LIOR-100	Gravel	100	0	Good
		Olson Creek Road	FWS-LIOR-015	Gravel	100	0	Poor
		Olson Creek Road	FWS-LIOR-015	Gravel	100	0	Good
		Olson Creek Road	FWS-LIOR-015	Gravel	100	0	Fair
		Rookery Road	FWS-LIOR-012	Gravel	100	1	Poor
		Rookery Road	FWS-LIOR-012	Gravel	100	1	Failed
		Rookery Road	FWS-LIOR-012	Gravel	100	1	Fair
		Squaw Creek Road	FWS-LIOR-106	Gravel	100	0.2	Good
		Squaw Creek Road	FWS-LIOR-106	Native	100	0.2	Good
		Starvation Flat Road	FWS-LIOR-011	Gravel	100	0	Fair
		Starvation Flat Road	FWS-LIOR-011	Gravel	100	0	Good
		Webb-King Road	FWS-LIOR-104	Gravel	100	0.1	Fair
		Webb-King Road	FWS-LIOR-104	Native	100	0.1	Failed
		Webb-King Road	FWS-LIOR-104	Gravel	100	0.1	Failed
	McNary NWR	Alfalfa Field Road	FWS-MCNA-122	Gravel	65	0	Good
		Cliff Unit Road	FWS-MCNA-117	Native	55	0.3	Failed
		East Millet Pond Road	FWS-MCNA-118	Gravel	80	0.1	Failed
		Game Dept. Road	FWS-MCNA-014	Gravel	100	0	Good
		Gasline Crossing Spur	FWS-MCNA-116	Native	55	0	Failed
		Hunters Road	FWS-MCNA-101	Gravel	65	0.2	Fair
		Johnson Pond Road	FWS-MCNA-120	Asphalt	80	0.1	Fair
		Lower BR Road	FWS-MCNA-105	Native	65	0	Fair
		Old Bridge Road	FWS-MCNA-123	Gravel	80	0	Fair
		Old Peninsula Highway	FWS-MCNA-112	Asphalt	70	0	Poor
		Peninsula Unit Entrance Road	FWS-MCNA-010	Gravel	100	0	Fair
		PSH #3 Road	FWS-MCNA-111	Gravel	70	0.2	Fair

Table 2. Combined SAMMS and RIP Road Data

State	FWS Unit	Route Name	Route ID	Surface	API	FCI	Condition
Washington	McNary NWR	Pump #2 Road	FWS-MCNA-103	Gravel	55	0	Good
		Quarry East Side Access	FWS-MCNA-110	Gravel	65	0.2	Fair
		Quarry Pond Road	FWS-MCNA-109	Gravel	80	0.2	Fair
		Ranger Road	FWS-MCNA-119	Gravel	65	0.2	Failed
		Twin River Access Main Road	FWS-MCNA-015	Asphalt	100	0	Fair
		Two Rivers Entrance Road	FWS-MCNA-012	Gravel	100	0.1	Fair
		Wallula Unit Road	FWS-MCNA-013	Gravel	100	0	Fair
		Winery Road	FWS-MCNA-100	Gravel	80	0.2	Fair
		Winery Road	FWS-MCNA-100	Native	80	0.2	Fair
	Nisqually NFH	Brown Farm Road	FWS-NISQ-010	Asphalt	100	0	Fair
	Ridgefield NWR	Auto Tour Route	FWS-RIDG-010	Gravel	100	0	Fair
		Auto Tour Route	FWS-RIDG-010	Gravel	100	0	Good
		Carty Unit Access Road	FWS-RIDG-100	Gravel	100	0	Good
	Toppenish NWR	Headquarters Road	FWS-TOPP-010	Gravel	100	0	Good
	Turnbull NWR	Pine Creek Auto Tour Route	FWS-TURN-011	Asphalt	55	0	Fair
		Pine Creek Auto Tour Route	FWS-TURN-011	Gravel	55	0	Good
		Refuge Entrance Road	FWS-TURN-010	Gravel	90	0	Good
		Refuge Entrance Road	FWS-TURN-010	Asphalt	90	0	Fair

Source: RIP, Cycle 4 (2007); SAMMS (2008)

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Ankeny NWR	Buena Vista Road South Parking	Gravel	70	n/a	Fair
	Restroom Parking	Gravel	100	n/a	Good
	Pintail Boardwalk Parking	Gravel	100	n/a	Good
	Field Five Parking	Gravel	55	0.07	Good
	Wintel Trailhead Parking	Gravel	100	n/a	Good
	Buena Vista Road North Parking	Gravel	70	n/a	Fair
	Sidney Road South Parking	Gravel	70	n/a	Good
	Wintel Road Middle Parking	Gravel	70	n/a	Good
	Eagle Marsh HC Parking	Concrete	n/a	n/a	Good
	Eagle Marsh Parking	Gravel	100	n/a	Fair
	Pintail Marsh Parking	Gravel	100	n/a	Excellent
	Buena Vista Road Middle Parking	Gravel	70	0.07	Fair
	Mohoff Parking	Gravel	80	0.07	Fair
	Wintel Road East Parking	Gravel	70	0.07	Good
	Wood Duck Pond Parking	Gravel	70	n/a	Excellent
	Sidney Road North Parking	Gravel	70	0.07	Fair
Bandon Marsh NWR	Bandon Marsh Overlook Parking	Asphalt	65	n/a	Good
	Ni Lestum Parking	Asphalt	65	n/a	Excellent
	HQ/Residence Parking	Asphalt	70	n/a	Excellent
	Office/Service Parking	Gravel	100	n/a	Excellent
	Taverner's Marsh Parking	Gravel	80	0.01	Good
	Coville Road West Parking	Gravel	80	0.02	Good
	Coville Road East Parking	Gravel	30	0.12	Poor
	Smithfield Wildlife Viewing Pull-out	Gravel	100	n/a	Excellent
	Visitor Kiosk and Restroom Parking	Gravel	100	n/a	Good
	Visitor Kiosk/Restroom HC Parking	Gravel	100	n/a	Excellent
	Morgan Lake Trailhead Parking	Gravel	100	n/a	Excellent
	Baskett Butte Trailhead Parking	Gravel	100	n/a	Excellent
Bear Lake NWR	West Rainbow Pullout North	Gravel	30	0.24	Failed
	Restroom Parking	Native	55	n/a	Fair
	Paris Dike Parking	Gravel	55	n/a	Fair
	West Rainbow Pullout South	Gravel	30	n/a	Failed
	Rainbow Boat Launch East	Gravel	n/a	n/a	Poor
	Rainbow Boat Launch West	Gravel	n/a	n/a	Fair
	Rainbow Hunting Blind Paking	Gravel	n/a	n/a	Fair
	Rainbow Canoe Trail Launch	Gravel	n/a	n/a	Fair
	Paris Dike Boat Trailer Parking	Gravel	n/a	n/a	Fair
	West Rainbow Parking	Gravel	80	n/a	Fair
	Rainbow Trailhead Parking	Gravel	n/a	n/a	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Camas NWR	North Headquarters Hunter Access	Gravel	n/a	n/a	Fair
	Visitor Parking	Asphalt	55	n/a	Good
Cold Springs NWR	Auto Tour Parking #1	Gravel	55	0.07	Fair
Cold Springs NWR	Auto Tour Parking #2	Gravel	55	0.07	Fair
	South End Dam Parking	Gravel	55	0.07	Fair
	South End Parking	Gravel	55	0.07	Fair
	Southeast Boat Launch	Gravel	n/a	n/a	Good
Columbia NWR	North Teal Lake Parking	Gravel	55	0.12	Fair
	Potholes Canal Parking	Gravel	55	n/a	Fair
	Pillar/Wigeon Parking	Gravel	55	0.12	Fair
	O'Sullivan Dam Parking	Gravel	55	0.07	Poor
	Soda Lake Campground Parking	Gravel	55	0.07	Good
	Soda Lake Campground Restroom/Overflow Parking	Gravel	55	0.07	Fair
	McManamon Lake Parking	Gravel	55	0.07	Fair
	Maintenance Area Parking	Gravel	55	0.07	Fair
	Frog Lake Trail Parking	Gravel	55	0.07	Fair
	Drunheller Interpretive Site	Gravel	55	n/a	Fair
	Hampton Lake Parking	Gravel	55	n/a	Fair
	March Unit 1 Parking	Gravel	55	n/a	Fair
	South Teal Lake Parking	Gravel	55	n/a	Fair
	Bobcat/Coyote Lake Parking	Gravel	55	n/a	Good
	Halfmoon Lake Parking	Gravel	55	n/a	Good
	Crab Creek Parking	Gravel	55	n/a	Poor
	Lower Crab Creek Trail Parking	Gravel	55	n/a	Fair
	Soda Lake Campground Boat Launch	Gravel	65	0.85	Good
	Black Lake Parking	Gravel	65	0.98	Good
	Blythe Lake Parking	Gravel	65	0.93	Fair
	Corfu Parking	Native	55	0.25	Fair
	Soda Lake Boat Ramp	Gravel	65	0.85	Fair
	Hutchinson Lake Parking	Gravel	55	1.00	Poor
	Hampton Lake Trailer Parking	Gravel	55	0.79	Fair
Deer Flat NWR	Lake Shore Drive Parking #2	Asphalt	30	0.48	Excellent
	Lake Shore Drive Parking #1	Asphalt	30	0.48	Good
	Upper Dam West Parking	Asphalt	55	n/a	Good
	Lake Shore Drive Parking #6	Asphalt	30	0.48	Good
	Gott's Point Parking #1	Gravel	30	n/a	Poor
	Lower Dam Beach Parking	Asphalt	30	0.02	Good

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Deer Flat NWR	Lower Dam Boat Ramp Parking	Asphalt	30	0.02	Good
	Iowa Ave Parking #1	Asphalt	30	0.07	Good
	Iowa Ave Parking #2	Asphalt	30	0.07	Good
	Gott's Point Parking #2	Gravel	30	0.07	Poor
	Lake Shore Drive Parking #8	Native	n/a	n/a	Fair
	Tio Lane Parking	Asphalt	45	0.12	Good
	Visitor Center Parking	Asphalt	100	0.11	Fair
	Upper Dam East Parking	Asphalt	55	0.02	Good
	Lake Shore Drive Parking #5	Asphalt	30	0.48	Excellent
	Lake Shore Drive Parking #4	Asphalt	30	0.48	Excellent
	Lake Shore Drive Parking #7	Asphalt	30	0.48	Good
	Lake Shore Drive Parking #3	Asphalt	30	0.48	Excellent
	Lower Dam Picnic Area Parking	Gravel	30	0.07	Good
Grays Harbor NWR	Refuge Parking	Asphalt	65	0.80	Fair
Grays Lake NWR	Headquarters Parking	Gravel	70	0.07	Good
	Bear Island Parking	Native	45	0.12	Poor
Hanalei NWR	Hanalei River Bridge Pull off	Asphalt	45	0.10	Poor
	Temple Parking	Gravel	45	0.13	Poor
	Hanalei Overlook Parking	Asphalt	30	n/a	Good
Hanford Reach National Monument	Wahluke North Parking	Gravel	n/a	n/a	Poor
	Parking Lot #2	Gravel	45	0.43	Good
	Parking Lot #3	Gravel	30	0.07	Fair
	Dog Trial Parking	Asphalt	n/a	n/a	Poor
	Parking Lot #7 and Boat Launch	Gravel	45	0.21	Fair
	Parking Lot #5	Gravel	n/a	1.00	Fair
	White Bluffs Landing Parking #2	Gravel	55	0.05	Good
	White Bluffs Landing Parking #1	Gravel	55	0.05	Good
	Parking Lot #8	Native	n/a	0.99	Fair
	Wahluke South Road - North Access	Native	n/a	n/a	Good
	Parking Lot #4	Gravel	45	0.12	Poor
	Parking Lot #1	Gravel	45	0.06	Fair
	Old Turret Site Parking	Asphalt	n/a	n/a	Fair
Hart Mountain NAR	Warner Pond Parking Area	Gravel	55	n/a	Fair
	Campbell Lake Overlook Parking Area	Gravel	55	n/a	Poor
	CCC Campground Parking	Gravel	n/a	n/a	Good
	Lookout Point Overlook Parking Area	Native	50	0.18	Fair
	Visitor Parking Area	Gravel	50	0.07	Good
	Warner Valley Overlook Parking Area	Gravel	50	0.07	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Julia Butler Hansen Refuge	Wildlife Viewing Site Parking	Asphalt	70	n/a	Good
	Center Rd Parking	Gravel	n/a	n/a	Poor
	Headquarters Parking	Asphalt	100	n/a	Good
Kealia Pond NWR	Staff Parking	Asphalt	50	n/a	Excellent
	Office Parking	Asphalt	100	n/a	Excellent
	Bus Turnaround	Asphalt	100	n/a	Excellent
Kilauea Point NWR	Kilauea Lighthouse Lower Parking	Asphalt	90	n/a	Good
	Kilauea Lighthouse Overflow Parking	Gravel	90	n/a	Good
	Kilauea Lighthouse Upper Parking	Asphalt	90	n/a	Good
	Overlook Parking	Asphalt	90	n/a	Good
Kootenai NWR	Island Trail Handicapped Parking	Asphalt	100	0.06	Fair
	Office Parking	Asphalt	100	n/a	Good
	Environmental Education Parking Lot	Asphalt	100	n/a	Good
	Forest Trail Parking	Gravel	100	n/a	Good
Kootenai NWR	CR 13 North Pullout	Gravel	n/a	n/a	Fair
	Friends Parking Lot	Gravel	n/a	n/a	Good
	CR 13 View Parking Lot	Gravel	n/a	n/a	Fair
	South Pond Parking	Gravel	100	0.07	Good
	East Day Use Parking	Gravel	100	0.07	Good
	Cascade Pond Overlook	Gravel	70	n/a	Fair
	Island Trail Parking	Gravel	100	0.06	Fair
	Island Pond Overlook	Gravel	70	n/a	Fair
	Headquarter Overflow Parking	Asphalt	100	n/a	Excellent
	ADA Myrtle Falls Parking Lot	Asphalt	100	n/a	Good
Little Pend Oreille NWR	Headquarters Visitor Information Parking	Gravel	100	n/a	Good
	Headquarters Parking	Gravel	100	n/a	Fair
	Potter's Pond Parking	Native	n/a	n/a	Poor
	McDowell Lake Overlook	Native	80	n/a	Poor
	Bayley Lake Parking	Gravel	n/a	n/a	Good
	Bear Creek Campground Parking	Native	80	0.12	Fair
Malheur NWR	Swan Pond Parking Area	Gravel	n/a	n/a	Good
	Visitor Headquarters Overflow Parking Area	Gravel	n/a	n/a	Fair
	Crane Pond Overlook Trail Parking	Gravel	n/a	n/a	Good
	Brenton Cabin Parking Lot	Gravel	n/a	n/a	Good
	East Canal Entrance Parking	Gravel	n/a	n/a	Fair
	Buena Vista Parking Area	Gravel	65	n/a	Fair
	Visitor Parking Area	Gravel	65	0.07	Good
	Krumbo Reservoir Parking Area	Gravel	65	0.07	Good
	P-Ranch Parking Area	Gravel	100	n/a	Good

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Malheur NWR	Krumbo Reservoir Boat Ramp Parking Area	Asphalt	65	n/a	Good
	Sodhouse Ranch Parking Area	Gravel	100	0.18	Good
	North Saddle Butte Parking Area	Native	100	0.10	Failed
	Narrows Parking Area	Native	100	0.18	Failed
	Opie Public Access Parking	Native	100	0.18	Failed
	Benson Pond Parking Area	Gravel	100	n/a	Good
	Visitor Handicap Parking Area	Asphalt	65	n/a	Good
McKay Creek NWR	McKay Reservoir Parking #1	Gravel	55	0.05	Fair
	McKay Reservoir Parking #4	Gravel	55	0.07	Good
	McKay Reservoir Parking #3	Gravel	55	0.07	Good
	McKay Reservoir Parking #2	Gravel	55	0.07	Good
	Shaw Road Parking #2	Gravel	55	0.07	Fair
	McKay Reservoir Parking #5	Gravel	55	0.07	Fair
	Shaw Road Parking #1	Gravel	55	0.06	Fair
	McKay Reservoir Boat Launch	Gravel	n/a	n/a	Good
	McKay Reservoir Parking #7	Gravel	55	0.05	Fair
	McKay Reservoir Parking #6	Gravel	55	1.00	Fair
	McKay Reservoir Parking #8	Gravel	55	n/a	Fair
	McKay Reservoir Dam Boat Launch	Gravel	55	n/a	Good
McNary NWR	Ranger Road Parking	Native	55	0.25	Failed
	Wallula Road Parking #1	Gravel	55	0.07	Fair
	Madame Dorian Parking	Gravel	n/a	n/a	Good
	Madame Dorian Restroom Parking	Gravel	n/a	n/a	Good
	Walla Walla River Fishing Access	Gravel	n/a	n/a	Good
	Quarry Pond Parking #2	Gravel	65	0.06	Fair
	Burbank Slough Parking	Gravel	n/a	0.97	Fair
	White-Tail Bay Parking	Gravel	55	n/a	Fair
	Dog Trial Parking	Native	40	0.44	Failed
	Two Rivers Primitive Parking	Gravel	40	0.25	Fair
	Wallula Road Parking #3	Gravel	55	n/a	Good
	Juniper Canyon Parking Lot	Gravel	n/a	n/a	Fair
	Casey Pond Parking	Gravel	65	0.10	Good
	Hunters Road Parking #2	Gravel	55	0.07	Fair
	Johnson's Pond Parking	Native	55	n/a	Poor
	Madame Dorian Boat Launch	Gravel	n/a	n/a	Good
	Casey Pond Boat Launching and Parking	Gravel	65	0.10	Good
	Quarry Pond Handicapped Parking	Concrete	n/a	n/a	Good
	Quarry Pond Parking #1	Gravel	55	n/a	Fair
	Ivarson Road Parking	Gravel	55	n/a	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
McNary NWR	Humorist Road Parking #1	Gravel	55	n/a	Fair
	Game Dept. Parking #2	Gravel	55	n/a	Fair
	East Millet Pond Parking	Gravel	55	n/a	Good
	Game Dept. Parking #1	Gravel	55	n/a	Good
	Headquarters Parking	Gravel	55	n/a	Good
	Madame Dorian Monument Parking	Gravel	n/a	n/a	Good
	Wallula Road Parking #2	Gravel	55	n/a	Good
	Game Dept. Parking #3	Gravel	n/a	n/a	Good
	Hunters Road Parking #1	Gravel	55	0.07	Fair
	Game Dept. Parking #5	Gravel	n/a	n/a	Good
	Wallula Road Handicapped Parking	Concrete	55	0.07	Excellent
	Old Peninsula Parking	Gravel	n/a	n/a	Fair
	Game Dept. Parking #4	Gravel	n/a	n/a	Good
	Humorist Road Parking #2	Gravel	55	0.02	Fair
	Humorist Road Parking #3	Asphalt	55	0.02	Good
Minidoka NWR	Office Parking	Gravel	65	0.07	Good
	Gifford Springs Parking	Native	65	0.12	Good
Nisqually NWR	Visitor Parking East	Asphalt	55	n/a	Good
	Visitor Parking West	Asphalt	55	n/a	Good
Oregon Islands NWR	HQ Parking	Asphalt	70	n/a	Excellent
	Coquille Point Parking	Asphalt	65	1.00	Good
Ridgefield NWR	Carty Unit Parking	Gravel	65	1.00	Fair
	River S Observation Parking	Concrete	65	n/a	Good
	River S Unit Main Parking	Gravel	65	0.07	Fair
	Headquarters Handicapped Parking	Concrete	65	n/a	Good
	Kiwa Trailhead Parking	Gravel	65	n/a	Fair
	Ridgeport Dairy Unit Parking #1	Asphalt	45	0.07	Good
	Headquarters Parking	Gravel	65	n/a	Good
Sheldon NWR	Virgin Valley Parking	Gravel	n/a	n/a	Good
	Headquarters Parking	Gravel	n/a	n/a	Good
	8A Information Kiosk Parking	Gravel	n/a	n/a	Good
	34A Kiosk Parking	Gravel	n/a	n/a	Good
	Hwy 140 Kiosk Parking	Gravel	n/a	n/a	Good
	South 8A Kiosk Parking	Native	n/a	n/a	Fair
	Big Spring Boat Ramp Parking Area	Gravel	80	0.06	Good
Toppenish NWR	Headquarters Parking	Gravel	55	n/a	Good
	Visitor Contact Parking	Gravel	65	0.07	Good
	Visitor Contact Handicapped Parking	Concrete	65	0.07	Good
	Pumphouse Road Parking	Gravel	55	0.07	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Tualatin River NWR	Headquarters Parking	Gravel	n/a	n/a	Excellent
	Disabled Parking	Concrete	n/a	n/a	Excellent
	Wayside Parking	Gravel	65	n/a	Excellent
Turnbull NWR	Kepple Peninsula Parking	Asphalt	n/a	n/a	Excellent
	Main Entrance Parking Lot	Asphalt	n/a	n/a	Good
	Kepple Lake Parking	Gravel	45	0.04	Good
	Restroom Parking	Asphalt	45	n/a	Excellent
	30 Acre Lake Trailhead Parking	Gravel	45	0.07	Good
	Blackhorse Lake Boardwalk Parking	Asphalt	45	n/a	Excellent
	Beaver Pond Trailhead Parking	Gravel	55	0.07	Fair
	Fee Station Parking	Gravel	65	0.07	Fair
	Headquarters Bus Parking	Asphalt	65	n/a	Good
	Headquarters Parking	Asphalt	65	n/a	Good
	Black Horse Restroom Parking Lot	Asphalt	n/a	n/a	Excellent
Umatilla NWR	Dike Parking	Gravel	55	n/a	Fair
	Whitcomb Parking #2	Gravel	55	n/a	Good
	Whitcomb Parking #3	Gravel	55	n/a	Fair
	Whitcomb Parking #7	Gravel	55	n/a	Fair
	Paterson Slough Parking #6	Native	55	n/a	Fair
	Parking Lot C	Gravel	55	n/a	Good
	Parking Lot E	Gravel	55	n/a	Good
	Ridge Unit Info East Parking	Gravel	55	n/a	Good
	Ridge Unit Info West Parking	Gravel	55	n/a	Good
	Paterson Slough Parking #5	Gravel	55	n/a	Fair
	Paterson Slough Boat Launch	Gravel	n/a	n/a	Fair
	Whitcomb Parking #1	Gravel	55	n/a	Good
	Whitcomb Parking #5	Gravel	55	n/a	Excellent
	Whitcomb Unit Information Parking	Gravel	55	n/a	Good
	Restroom Parking	Gravel	55	0.07	Good
	Parking Lot G	Gravel	55	0.08	Fair
	Visitor Information Parking	Gravel	55	0.08	Fair
	Whitcomb Parking #4	Gravel	55	0.24	Good
	Observation Deck Parking	Concrete	65	n/a	Good
	Visitor Information Handicapped Parking	Concrete	65	0.06	Good
	Ridge Unit Parking #2	Gravel	55	n/a	Good
	Paterson Slough Parking #3	Gravel	55	n/a	Fair
	Paterson Slough Parking #2	Gravel	55	n/a	Fair
	Paterson Slough Parking #1	Gravel	55	n/a	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
Umatilla NWR	Parking Lot D	Gravel	55	n/a	Fair
	Parking Lot B	Gravel	55	n/a	Fair
	Overlook Parking	Gravel	55	n/a	Fair
	Whitcomb Parking #6	Gravel	55	n/a	Excellent
	Whitcomb Parking #8	Gravel	55	n/a	Good
	Paterson Slough Parking #4	Gravel	55	n/a	Fair
Willapa NWR	Headquarters Parking	Asphalt	70	n/a	Good
	Leadbetter Unit Parking	Asphalt	n/a	n/a	Good
	Bear River Interpretive Site Parking	Gravel	55	1.00	Good
	Teal Slough Parking 1	Gravel	n/a	n/a	Fair
	Boat Launch	Asphalt	70	n/a	Good
	Riekkola Parking	Native	80	0.76	Poor
	Lewis Unit Parking	Gravel	80	0.83	Poor
	Photo Blind Parking	Gravel	n/a	n/a	Fair

Table 3. RIP and SAMMS Parking Lot Data by Unit

FWS Unit	Name	Surface	API	FCI	Condition
William L Finley NWR	Vehicle Turnout at Turtle Flats (West)	Gravel	55	n/a	Good
	Bruce Road Overlook Parking	Gravel	55	n/a	Good
	Refuge Office Parking	Gravel	70	0.81	Excellent
	Hunter Parking		n/a	n/a	
	Restroom Parking		n/a	n/a	
	Feichter House Parking	Gravel	55	0.07	Good
	Mill Hill Trail HC Parking	Concrete	n/a	n/a	Excellent
	McFadden Marsh Observation Blind Parking	Gravel	55	n/a	Excellent
	Vehicle Turnout at Bellfountain Entrance	Gravel	n/a	n/a	Good
William L Finley NWR	Parking Lot #1	Gravel	n/a	n/a	Good
	Snag Boat Bend HC Parking South	Concrete	n/a	n/a	Excellent
	Snag Boat Bend HC Parking North	Concrete	n/a	n/a	Excellent
	Refuge Office Parking - Handicap	Concrete	n/a	n/a	Excellent
	McFadden Marsh East Parking Lot	Gravel	55	n/a	Good
	Field #4 Turnout	Gravel	55	n/a	Excellent
	Turtle Flats East	Gravel	55	n/a	Good
	McFadden Marsh West Parking Lot	Gravel	55	n/a	Excellent
	Pigeon Butte Trail Parking	Gravel	55	n/a	Excellent
	Woodpecker Loop Parking	Gravel	55	n/a	Excellent
	Cheadle Marsh Parking	Gravel	55	n/a	Good
	Mill Hill Trail Parking	Gravel	55	n/a	Good
	Snag Boat bend Parking	Gravel	55	n/a	Good
	Field #22 Vehicle Turnout	Gravel	55	n/a	Excellent

Source: RIP, Cycle 4 (2007). SAMMS (2008)

Table 4. Combined SAMMS and RIP FWS Trail Data

	Asset ID	Service Unit	Name	Surface	Condition	API	FCI
Hawaii	10044595	Kilauea Point NWR	Kilauea Lighthouse Trail	Paved	Good	70	0
	10053554	Kilauea Point NWR	Kilauea Lighthouse Trail	Paved	Good	100	0.97
	10053555	Kilauea Point NWR	Kilauea Lighthouse Trail	Paved	Good	100	0
	10053556	Kilauea Point NWR	Kilauea Lighthouse Trail	Paved	Good	45	0.81
	10002234	Hanalei NWR	Okolehao Trail	Unpaved	Excellent	45	0.71
Idaho	10051579	Camas NWR	Birding Trail	Unpaved	Excellent	55	0
	10005470	Kootenai NWR	Chickadee Trail	Paved	Excellent	100	0
	10036379	Kootenai NWR	Deep Creek Trail	Unpaved	Not Rated	100	0.11
	N/A	Deer Flat NRW	East Shoreline Trail	Unpaved	Not Rated	0	0
	10036378	Kootenai NWR	Forest Trail	Unpaved	Excellent	0	0
	10036380	Kootenai NWR	Island Pond Trail	Unpaved	Excellent	100	0
Idaho	N/A	Minidoka NWR	Lakeview Trail	Unpaved	Excellent	0	0
	10050209	Kooskia NFH	Mill Pond Trail	Unpaved	Excellent	0	0
	10005460	Kootenai NWR	Murtle Falls Trail	Paved	Excellent	100	0
	1005383	Deer Flat NRW	Nature Trail	Unpaved	Excellent	0	0
	N/A	Bear Lake NWR	Rainbow Hunting Bliind Trail	Unpaved	Excellent	0	0
	10053268	Bear Lake NWR	Rainbow Trail	Unpaved	Excellent	80	0
	10047348	Camas NWR	Wildlife Viewing Trail	Paved	Excellent	55	0
Nevada	10036941	Pahranagat NWR	North Marsh Dike Trail	Unpaved	Excellent	0	0
	10036941	Pahranagat NWR	Upper Lake Trail	Unpaved	Not Rated	0	0
Oregon	10039507	Ankeny NWR	Ankeny Hill Overlook Trail	Unpaved	Excellent	100	0
	10040550	Malheur NWR	Barns Springs Footpath	Paved	Not Rated	0	0
	10040550	Malheur NWR	Barns Springs Footpath	Unpaved	Not Rated	0	0
	10004448	William L. Finley NWR	Beaver Pond Trail	Unpaved	Very Poor	55	0.57
	10004085	Malheur NWR	Benson Pond Trail	Unpaved	Excellent		
	N/A	Bandon Marsh NWR	Boardwalk Trail	Unpaved	Excellent		
	N/A	Malheur NWR	Buena Vista Overlook Trail	Unpaved	Excellent		
	10048207	William L. Finley NWR	Cabell Marsh Overlook Trail	Unpaved	Excellent	55	
	10004445	William L. Finley NWR	Cabell Marsh Trail	Unpaved	Not Rated	55	0.27
	N/A	Umatilla NWR	Callows Overlook Trail	Paved	Excellent		
	10004516	Cape Meares NWR	Cape Meares Scenic Trail	Unpaved	Good	65	
	10004451	William L. Finley NWR	Cattail Pond Trail	Unpaved	Very Poor	55	
	10054803	Tualatin River NWR	Centennial Trail	Unpaved	Excellent	65	
	10004568	Oregon Islands NWR	Coquille Point Trail	Unpaved	Excellent	55	
	10004569	Oregon Islands NWR	Coquille Point Trail	Unpaved	Excellent	55	0.83
	10004573	Oregon Islands NWR	Coquille Point Trail	Unpaved	Excellent	55	

Table 4. Combined SAMMS and RIP FWS Trail Data

	Asset ID	Service Unit	Name	Surface	Condition	API	FCI
Oregon	N/A	Malheur NWR	Crane Pond Overlook trail	Unpaved	Excellent		
	10048577	William L. Finley NWR	Dike Trail	Unpaved	Excellent		
	10041329	Malheur NWR	East Canal Trail	Unpaved	Not Rated		
	N/A	William L. Finley NWR	Finley Prairie Boardwalk Trail	Unpaved	Excellent		
	N/A	Warm Springs NFH	Fish Tanks Trail	Unpaved	Not Rated		
	10037672	Malheur NWR	Headquarters Overlook Trail	Unpaved	Excellent	65	
	N/A	Warm Springs NFH	Holding Ponds Observation Trail	Unpaved	Excellent		
	N/A	Baskett Slough NWR	Inter-tie Trail	Unpaved	Excellent		
	10048902	William L. Finley NWR	Inter-Tie Trail	Unpaved	Excellent	55	0.83
	10003359	McNary NWR	Juniper Canyon Trail	Unpaved	Excellent		
	N/A	McNary NWR	Juniper Canyon Trail	Unpaved	Excellent		
	N/A	Umatilla NWR	Kathy's Pond Trail	Paved	Fair		
	N/A	Malheur NWR	Long Barn Trail	Unpaved	Not Rated		
	10054803	Tualatin River NWR	Main Trail	Unpaved	Excellent	65	
	10048201	William L. Finley NWR	McFadden Marsh Observation Blind Trail	Unpaved	Excellent	55	
	N/A	Cold Springs NWR	Memorial Marsh Trail	Unpaved	Excellent		
	N/A	William L. Finley NWR	Mid Refuge Connection Trail	Unpaved	Not Rated		
	10004446	William L. Finley NWR	Mill Hill Trail	Unpaved	Excellent	55	0.39
	10004363	Baskett Slough NWR	Moffiti Marsh Trail	Unpaved	Not Rated		
	10004373	Baskett Slough NWR	Morgan Lake Trail	Unpaved	Excellent	100	0.14
	N/A	Umatilla NWR	Morrow County Heritage Trail	Paved	Not Rated		
	10004454	William L. Finley NWR	Pigeon Butte Trail	Unpaved	Not Rated	55	0.66
	10039128	Ankeny NWR	Pintail/Egret Marsh Trail	Unpaved	Excellent		
	10004399	Ankeny NWR	Rail Trail Loop	Unpaved	Excellent		
	10039518	Ankeny NWR	Rail Trail Loop	Unpaved	Excellent	100	
	10004373	Baskett Slough NWR	Rich Guadagno Memorial Trail	Unpaved	Excellent	100	0.14
	N/A	Malheur NWR	River Trail	Unpaved	Not Rated		
	10004608	Tualatin River NWR	Seasonal Trail	Unpaved	Not Rated		
	10048577	William L. Finley NWR	Snag Boat Bend Lake Creek Trail	Unpaved	Very Poor		
	10048577	William L. Finley NWR	Snag Boat Boardwalk Trail	Unpaved	Excellent		
	N/A	Malheur NWR	Sod House Ranch Trail	Unpaved	Good		
	10003759	Julia Butler Hansen Refuge for the Columbian White-tailed Deer	Tenasillahe Island Trail	Unpaved	Not Rated		
	10041830	Nestucca Bay NWR	Tsunami Escape Route	Paved	Excellent	50	0.45
	10041830	Nestucca Bay NWR	Tsunami Escape Route	Unpaved	Excellent	50	0.45

Table 4. Combined SAMMS and RIP FWS Trail Data

	Asset ID	Service Unit	Name	Surface	Condition	API	FCI
Oregon	10048906	William L. Finley NWR	Turtle Flats Walkway Trail	Unpaved	Excellent	55	
	10048577	William L. Finley NWR	Turtle loop Trail	Unpaved	Excellent		
	N/A	Umatilla NWR	Umatilla Heritage Spur Trail	Unpaved	Not Rated		
	10057111	Hart Mountain National Antelope Refuge	Warner Valley Overlook	Unpaved	Excellent	55	0.19
	10057111	Hart Mountain National Antelope Refuge	Warner Valley Overlook 2	Unpaved	Excellent	55	0.19
	10054803	Tualatin River NWR	Wayside Trail	Unpaved	Excellent	65	
	10004491	William L. Finley NWR	Woodpecker Trail	Unpaved	Excellent	70	0.93
Washington	10036009	Turnbull NWR	30-Acre Lake Hiking Trail	Unpaved	Not Rated	55	0.04
	10003492	Nisqually NWR	Bank Fishing Trail	Unpaved	Excellent	55	
	10003747	Willapa NWR	Bearberry Trail	Unpaved	Fair	65	0.07
	N/A	Turnbull NWR	Blackhorse Lake Boardwalk	Unpaved	Excellent		
	10036009	Turnbull NWR	Blackhorse Lake Hiking Trail	Unpaved	Excellent	55	0.04
	10036009	Turnbull NWR	Blackhorse Lake Woodchip Trail	Unpaved	Excellent	55	0.04
	10036009	Turnbull NWR	Bluebird Trail	Unpaved	Not Rated	55	0.04
	N/A	Little White Salmon NFH	Bluff Fishing Area	Unpaved	Excellent		
	N/A	Little White Salmon NFH	Boat Storage Area	Unpaved	Excellent		
	10003484	Nisqually NWR	Brown Farm Dike Trail	Unpaved	Excellent		
	10051070	McNary NWR	Burbank Slough Wildlife Trail	Unpaved	Excellent		
	10051071	McNary NWR	Burbank Slough Wildlife Trail	Unpaved	Excellent		
	10051076	McNary NWR	Burbank Slough Wildlife Trail	Unpaved	Excellent		
	N/A	McNary NWR	Burbank Slough Wildlife Trail	Unpaved	Excellent		
	10003687	Willapa NWR	Center Road Trail	Unpaved	Excellent		
	10003245	Columbia NWR	Coyote Lake Trail	Unpaved	Excellent		
	N/A	Columbia NWR	Coyote Lake Trail	Unpaved	Excellent		
	10003122	Columbia NWR	Crab Creek Trail	Unpaved	Excellent	55	0.1
	10002862	Winthrop NFH	Dike Trail	Unpaved	Not Rated		
	10042349	Willapa NWR	Don Bonker Trail	Unpaved	Excellent	80	0.85
	N/A	Toppenish NWR	East Wildlife Foot Trail	Unpaved	Excellent		
	10003122	Columbia NWR	Frog Lake Trail	Unpaved	Excellent	55	0.1
	N/A	Columbia NWR	Half Moon Lake Trail	Unpaved	Excellent		
	N/A	Toppenish NWR	Handicapped Access Road	Unpaved	Excellent		
	N/A	Little Pend Oreille NWR	Headquarters Pond Trail	Unpaved	Excellent		
	10036009	Turnbull NWR	Headquarters Trail	Unpaved	Not Rated	55	0.04
	10003688	Willapa NWR	High Point Trail	Unpaved	Excellent	100	

Table 4. Combined SAMMS and RIP FWS Trail Data

	Asset ID	Service Unit	Name	Surface	Condition	API	FCI
Washington	N/A	Little White Salmon NFH	Highway Bridge Area	Unpaved	Excellent		
	10003565	Dungeness NWR	Horse Trail	Unpaved	Excellent	50	0.86
	10048256	Leavenworth NFH	Icicle Creek Nature Trail	Paved	Excellent		
	10048256	Leavenworth NFH	Icicle Creek Nature Trail	Unpaved	Excellent		
	10036009	Turnbull NWR	Kepple Lake Lookout Trail	Unpaved	Excellent	55	0.04
	10054711	Turnbull NWR	Kepple Penisula Trail	Unpaved	Excellent	45	
	10003659	Ridgefield NWR	Kiwa Trail	Unpaved	Excellent	65	
	10054989	Columbia NWR	Lake Marie Trail	Unpaved	Not Rated		
	10003746	Willapa NWR	Leadbetter Bay Loop Trail	Unpaved	Excellent	65	
	10003671	Willapa NWR	Lewis Cross Dike Trail	Unpaved	Not Rated		
	10003670	Willapa NWR	Lewis Dike Trail	Unpaved	Not Rated		
	10003432	Toppenish NWR	Lookout Trail	Paved	Excellent	65	
	10003761	Julia Butler Hansen Refuge for the Columbian White-tailed Deer	Mainland Center Road	Unpaved	Not Rated		
	10003122	Columbia NWR	Marsh Loop Trail	Unpaved	Excellent	55	0.1
	N/A	Columbia NWR	Marsh Unit 1 Trail	Unpaved	Excellent		
	10003523	San Juan Islands NWR	Matia Island Trail	Paved	Excellent	80	
	10003523	San Juan Islands NWR	Matia Island Trail	Unpaved	Excellent	80	
	10048901	Nisqually NWR	McAllister Cross Dike Trail	Unpaved	Excellent	0	
	10055852	Little Pend Oreille NWR	Mcmeet Trail	Unpaved	Excellent	55	
	N/A	Little Pend Oreille NWR	Mill Butte Trail	Unpaved	Excellent		
	10051063	McNary NWR	Millet Pond Trail	Unpaved	Excellent		
	N/A	McNary NWR	Millet Pond Trail	Unpaved	Excellent		
	10003687	Willapa NWR	No Name Trail	Unpaved	Excellent		
	10003599	Ridgefield NWR	Oaks to Wetland Trail	Unpaved	Excellent		
	10003625	Ridgefield NWR	Observation Blind Trail	Paved	Good	65	
	N/A	Little Pend Oreille NWR	Old Timer's Horse Trail	Unpaved	Excellent		
	10003692	Willapa NWR	Paradise Point Spur Trail	Unpaved	Excellent	80	
	10003691	Willapa NWR	Paradise Point Trail	Unpaved	Good	80	0.01
	10003695	Willapa NWR	Paradise Point Trail	Unpaved	Good	100	
	N/A	Umatilla NWR	Paterson Old Road	Paved	Excellent		
	N/A	Umatilla NWR	Paterson Old Road	Unpaved	Excellent		
	10003361	McNary NWR	Peninsula Hiking Trail	Unpaved	Not Rated		
	10003364	McNary NWR	Peninsula Hiking Trail	Paved	Not Rated		
	N/A	McNary NWR	Peninsula Hiking Trail	Unpaved	Not Rated		

Table 4. Combined SAMMS and RIP FWS Trail Data

	Asset ID	Service Unit	Name	Surface	Condition	API	FCI
Washington	N/A	McNary NWR	Peninsula Horse Trail	Unpaved	Excellent		
	10003564	Dungeness NWR	People Trail	Unpaved	Excellent	80	0.98
	N/A	Columbia NWR	Pillar-Wigeon-Hampton Lake Trail	Unpaved	Good		
	10054378	Turnbull NWR	Pine Lake Loop Trail	Paved	Excellent	65	
	10054378	Turnbull NWR	Pine Lake Loop Trail	Unpaved	Excellent	65	
	N/A	Columbia NWR	Quail Lake Trail	Unpaved	Excellent		
	N/A	McNary NWR	Quarry Lake Trail	Unpaved	Excellent		
	10054423	Entiat NFH	Red Willow River Walk Trail	Unpaved	Excellent		
	10003493	Nisqually NWR	Ring Dike Trail	Unpaved	Excellent	55	
	10003505	Nisqually NWR	Road to Twin Barns	Unpaved	Not Rated		
	10045080	Little White Salmon NFH	Rocky Point	Unpaved	Excellent		
	10052501	Willapa NWR	Salmon Art Trail	Unpaved	Excellent		
	10052502	Willapa NWR	Salmon Art Trail	Unpaved	Excellent		
	10053967	Willapa NWR	Salmon Art Trail	Unpaved	Excellent	80	
	10003689	Willapa NWR	Sand Spit Trail	Unpaved	Excellent	100	
	10048685	Grays Harbor NWR	Sandpiper Trail	Paved	Excellent	65	
	10003690	Willapa NWR	Sawlog Trail	Unpaved	Excellent	70	0.2
	10048912	Nisqually NWR	Shannon Slough Boardwalk Trail	Unpaved	Excellent		
	N/A	Hanford Reach National Monument	Shoreline Trail	Unpaved	Excellent		
	10003689	Willapa NWR	Smoky Hallow Trail	Unpaved	Excellent	100	
	10045080	Little White Salmon NFH	Social Security Trail	Unpaved	Excellent		
	10036822	Willapa NWR	Teal Slough Trail	Unpaved	Not Rated		
	10003516	Nisqually NWR	Twin Barnes Loop Trail	Paved	Excellent		
	10003516	Nisqually NWR	Twin Barnes Loop Trail	Unpaved	Excellent		
	N/A	McNary NWR	Wallula Bird Trail	Unpaved	Excellent		
	N/A	McNary NWR	Wallula Horse Trail	Unpaved	Excellent		
	10004777	Hanford Reach National Monument	Waluke Pond Trail	Unpaved	Not Rated		
	10004743	Hanford Reach National Monument	Waluke Walking Trail	Unpaved	Not Rated		
	10003433	Toppenish NWR	Wildlife Foot Trail	Unpaved	Excellent	55	
	10055693	Conboy Lake NWR	Willard Springs Foot Trail	Unpaved	Excellent	80	

Source: RIP, Cycle 3 (2004), Cycle 4 not available for trails at the time of publication; SAMMS (2008)

Table 5. FWS Trail Deficiencies

State	Service Unit	Type of Deficiency	Number of Deficient Locations
Hawaii	Kilauea Point	Erosion	1
Oregon	Cape Meares NWR	Trail Structure	4
	Malheur NWR	Drainage	1
	Umatilla NWR	Trail Structure	1
	William L. Finley NWR	Erosion	3
		Drainage	6
Washington	Columbia NWR	Drainage	3
	Leavenworth NFH	Trail Structure	3
	Ridgefield NWR	Trail Location	1
		Erosion	1
	Turnbull NWR	Trail Structure	1
	Willapa NWR	Trail Structure	2
		Trail Location	2
		Erosion	3
		Drainage	16

Source: U.S. Fish and Wildlife Service, RIP Cycle 3 (2007), Cycle 4 not available for Deficiencies

Table 6. Road Conditions by Surface Type

State	Service Unit	Surface	Condition	Miles	% in Unit
Hawaii	Hanalei NWR	Asphalt	Failed	0.07	58%
		Gravel	Failed	0.05	42%
	Kealia Pond NWR	Asphalt	Fair	0.39	100%
	Kilauea Point NWR	Asphalt	Fair	0.21	100%
Idaho	Bear Lake NWR	Gravel	Fair	1.24	22%
		Gravel	Good	4.47	78%
	Camas NWR	Asphalt	Fair	0.15	2%
		Gravel	Good	6.55	98%
	Deer Flat NWR	Asphalt	Fair	0.18	15%
		Asphalt	Poor	0.25	21%
		Gravel	Fair	0.77	64%
	Grays Lake NWR	Gravel	Good	0.51	100%
	Hagerman NFH	Asphalt	Fair	0.11	13%
		Asphalt	Poor	0.38	45%
		Gravel	Fair	0.35	42%
	Kooskia NFH	Asphalt	Fair	0.14	100%
	Kootenai NWR	Asphalt	Fair	0.06	1%
		Gravel	Good	4.70	99%
	Minidoka NWR	Gravel	Failed	5.08	46%
		Gravel	Fair	2.58	23%
		Gravel	Good	0.17	2%
		Gravel	Poor	3.25	29%
	Oxford Slough WPA	Gravel	Good	0.24	100%
Nevada	Sheldon NWR	Gravel	Fair	3.77	3%
		Gravel	Good	76.07	57%
		Gravel	Poor	2.11	2%
		Native	Failed	8.14	6%
		Native	Fair	24.08	18%
		Native	Good	13.71	10%
		Native	Poor	5.59	4%
Oregon	Ankeny NWR	Gravel	Excellent	0.14	26%
		Gravel	Good	0.39	74%
	Bandon Marsh NWR	Asphalt	Good	0.05	100%
	Baskett Slough NWR	Gravel	Excellent	0.55	100%
	Cape Meares NWR	Asphalt	Poor	0.51	100%
	Cold Springs NWR	Gravel	Good	2.25	100%
	Eagle Creek NFH	Asphalt	Fair	0.04	8%
		Asphalt	Good	0.15	31%
		Gravel	Good	0.30	61%

Table 6. Road Conditions by Surface Type

State	Service Unit	Surface	Condition	Miles	% in Unit
Oregon	Hart Mountain NWR	Gravel	Failed	1.15	2%
		Gravel	Good	10.66	18%
		Native	Failed	15.53	27%
		Native	Fair	11.11	19%
		Native	Good	18.35	32%
		Native	Poor	0.85	1%
	Malheur NWR	Asphalt	Failed	0.31	1%
		Gravel	Failed	1.02	2%
		Gravel	Fair	5.83	12%
		Gravel	Good	37.80	78%
		Gravel	Poor	2.06	4%
		Native	Failed	1.46	3%
	McKay Creek NWR	Asphalt	Fair	0.51	17%
		Gravel	Fair	1.61	53%
		Gravel	Good	0.91	30%
	Nestucca Bay NWR	Gravel	Good	1.13	100%
	Tualatin River NWR	Gravel	Excellent	0.09	24%
		Gravel	Good	0.29	76%
	Umatilla NWR	Asphalt	Poor	2.88	21%
		Gravel	Fair	0.70	5%
		Gravel	Good	10.30	74%
	Warm Springs NFH	Gravel	Good	0.10	100%
	William F. Finley NWR	Asphalt	Good	0.05	1%
		Gravel	Excellent	1.27	35%
		Gravel	Good	2.27	63%
Washington	Little Sandy NWR	Asphalt	Fair	1.33	87%
		Asphalt	Poor	0.20	13%
	Abernathy FTC	Asphalt	Poor	0.05	100%
	Columbia NWR	Gravel	Failed	0.56	3%
		Gravel	Fair	5.28	33%
		Gravel	Good	9.33	58%
		Gravel	Poor	0.99	6%
	Conboy Lake NWR	Gravel	Good	0.72	100%
	Entiat NFH	Asphalt	Fair	0.07	100%

Table 6. Road Conditions by Surface Type

State	Service Unit	Surface	Condition	Miles	% in Unit
Washington	Hanford Reach National Monument	Asphalt	Failed	0.26	1%
		Asphalt	Poor	8.18	29%
		Gravel	Failed	0.68	2%
		Gravel	Fair	0.71	2%
		Gravel	Good	17.65	62%
		Native	Poor	1.05	4%
	Julia Butler Hanson NWR	Asphalt	Fair	0.14	100%
	Leavenworth NFH	Asphalt	Fair	0.27	36%
		Asphalt	Poor	0.48	64%
	Little Pend Oreille NWR	Gravel	Failed	11.29	24%
		Gravel	Fair	12.48	26%
		Gravel	Good	11.49	24%
		Gravel	Poor	3.46	7%
		Native	Failed	7.59	16%
		Native	Fair	0.65	1%
		Native	Good	0.16	0%
		Native	Poor	0.03	0%
	Makah NFH	Asphalt	Poor	0.12	100%
	McNary NWR	Asphalt	Fair	0.60	4%
		Asphalt	Poor	1.05	7%
		Gravel	Failed	1.31	9%
		Gravel	Fair	7.15	50%
		Gravel	Good	2.11	15%
		Native	Failed	0.56	4%
		Native	Fair	1.38	10%
	Nisqually NFH	Asphalt	Fair	0.62	100%
	Ridgefield NWR	Gravel	Fair	2.01	44%
		Gravel	Good	2.58	56%
	Spring Creek NFH	Asphalt	Failed	0.14	14%
		Asphalt	Poor	0.88	86%
	Toppenish NWR	Gravel	Good	0.46	100%
	Turnbull NWR	Asphalt	Fair	0.68	9%
		Gravel	Good	6.48	91%
	Willard NFH	Asphalt	Poor	0.11	100%
	Winthrop NFH	Asphalt	Poor	0.12	100%

Source: RIP, Cycle 4 (2007)

Welcome and Orient

Population trends are used in the baseline conditions analysis as a general indicator for future visitation. Population trends were derived from U.S. Census datasets. Census data from 2000 and 2008 were used to illustrate recent trends, while U.S. Census 2030 projections were used to indicate possible future trends. The summaries were created by using GIS to union county level population data with Service units and are shown in Table 7.

Gateway communities were identified using U.S. Census data, supplemented with expert knowledge from FWS on which communities serve as gateways.

Table 7. Population Change

Facility Name	Intersecting Counties and States	Population (2000 - 2008)					Projections (2008 - 2030)		
		2000	2008	% Change	Difference	Average Change by FWS Facility	2030	% Change	Median Change by FWS Facility
Abernathy Fish Technology Center	Cowlitz, Washington	92,948	100,917	9%	7,969	9%	122,376	21%	21%
Ankeny National Wildlife Refuge	Marion, Oregon	284,834	319,114	12%	34,280	12%	368,065	15%	15%
Bandon Marsh National Wildlife Refuge	Coos, Oregon	62,779	64,582	3%	1,803	3%	81,124	26%	26%
Baskett Slough National Wildlife Refuge	Polk, Oregon	62,380	73,363	18%	10,983	18%	80,608	10%	10%
Bear Lake National Wildlife Refuge	Bear Lake, Idaho	6,411	6,378	-1%	-33	-1%	8,610	35%	35%
Bear Valley National Wildlife Refuge	Klamath, Oregon	63,775	67,542	6%	3,767	6%	82,411	22%	22%
Camas National Wildlife Refuge	Jefferson, Idaho	19,155	23,831	24%	4,676	24%	25,726	8%	8%
Cape Meares National Wildlife Refuge	Tillamook, Oregon	24,262	26,232	8%	1,970	8%	31,352	20%	20%
Clearwater Fish Hatchery	Clearwater, Idaho	8,930	9,020	1%	90	1%	11,993	33%	33%
Cold Springs National Wildlife Refuge	Umatilla, Oregon	70,548	73,475	4%	2,927	4%	91,163	24%	24%
Columbia National Wildlife Refuge	Adams, Washington	16,428	17,743	8%	1,315	10%	21,629	22%	19%
Conboy Lake National Wildlife Refuge	Klickitat, Washington	19,161	20,532	7%	1,371	7%	25,228	23%	23%
Copalis National Wildlife Refuge	Grays Harbor, Washington	67,194	72,241	8%	5,047	8%	88,468	22%	22%
Deer Flat National Wildlife Refuge	Canyon, Idaho	131,441	186,223	42%	54,782	10%	176,531	-5%	22%
	Malheur, Oregon	31,615	31,772	0%	157		40,853	29%	
	Owyhee, Idaho	10,644	11,683	10%	1,039		14,295	22%	
	Payette, Idaho	20,578	23,510	14%	2,932		27,637	18%	
	Washington, Idaho	9,977	10,423	4%	446		13,400	29%	
Dungeness National Wildlife Refuge	Clallam, Washington	64,525	71,585	11%	7,060	11%	84,954	19%	19%
Dworshak National Fish Hatchery	Clearwater, Idaho	8,930	9,020	1%	90	1%	11,993	33%	33%
Eagle Creek National Fish Hatchery	Clackamas, Oregon	338391	382,316	13%	43,925	13%	437,272	14%	14%
Entiat National Fish Hatchery	Chelan, Washington	66,616	73,445	10%	6,829	10%	87,707	19%	19%
Flattery Rocks National Wildlife Refuge	Clallam, Washington	64,525	71,585	11%	7,060	11%	84,954	19%	19%
Franz Lake National Wildlife Refuge	Skamania, Washington	9,872	11,074	12%	1,202	12%	12,998	17%	17%
Grays Harbor National Wildlife Refuge	Grays Harbor, Washington	67,194	72,241	8%	5,047	8%	88,468	22%	22%
Grays Lake National Wildlife Refuge	Bonneville, Idaho	82,522	99,474	21%	16,952	8%	110,831	11%	25%
	Caribou, Idaho	7,304	7,031	-4%	-273		9,810	40%	
Hagerman National Fish Hatchery	Gooding, Idaho	14,155	15,200	7%	1,045	7%	19,011	25%	25%
Hakalau Forest National Wildlife Refuge	Hawaii, Hawaii	148,677	183,508	23%	34,831	23%	174,488	-5%	-5%
Hanalei National Wildlife Refuge	Kauai, Hawaii	58,463	63,106	8%	4,643	8%	68,612	9%	9%
Hanford Reach National Monument	Adams, Washington	16,428	17,743	8%	1,315	5%	21,629	22%	32%
	Benton, Washington	142,475	165,941	16%	23,466		187,584	13%	
	Franklin, Washington	49,347	73,203	48%	23,856		64,971	-11%	
	Grant, Washington	74,698	84,241	13%	9,543		98,348	17%	

Table 7. Population Change

Facility Name	Intersecting Counties and States	Population (2000 - 2008)					Projections (2008 - 2030)		
		2000	2008	% Change	Difference	Average Change by FWS Facility	2030	% Change	Median Change by FWS Facility
Hart Mountain National Antelope Refuge	Harney, Oregon	7,609	7,266	-5%	-343	-2%	9,832	35%	32%
	Lake, Oregon	7,422	7,489	1%	67		9,591	28%	
Huleia National Wildlife Refuge	Kauai, Hawaii	58,463	63,106	8%	4,643	8%	68,612	9%	9%
Irrigon Fish Hatchery	Morrow, Oregon	10,995	12,325	12%	1,330	5%	14,208	15%	23%
	Wallowa, Oregon	7,226	7,143	-1%	-83		9,338	31%	
Julia Butler Hansen Refuge For The Columbian White-Tailed Deer	Clatsop, Oregon	35,630	37,866	6%	2,236	8%	46,041	22%	21%
	Columbia, Oregon	43,560	49,719	14%	6,159		56,289	13%	
	Cowlitz, Washington	92,948	100,917	9%	7,969		122,376	21%	
	Wahkiakum, Washington	3,824	4,143	8%	319		5,035	22%	
Kakahaia National Wildlife Refuge	Maui, Hawaii	128,094	147,939	15%	19,845	15%	150,331	2%	2%
Kealia Pond National Wildlife Refuge	Maui, Hawaii	128,094	147,939	15%	19,845	15%	150,331	2%	2%
Kilauea Point National Wildlife Refuge	Kauai, Hawaii	58,463	63,106	8%	4,643	8%	68,612	9%	9%
Klamath Marsh National Wildlife Refuge	Klamath, Oregon	63,775	67,542	6%	3,767	6%	82,411	22%	22%
Kooskia National Fish Hatchery	Idaho, Idaho	15,511	15,727	1%	216	1%	20,832	32%	32%
Kootenai National Wildlife Refuge	Boundary, Idaho	9,871	11,086	12%	1,215	12%	13,257	20%	20%
Leavenworth National Fish Hatchery	Chelan, Washington	66,616	73,445	10%	6,829	10%	87,707	19%	19%
Lewis And Clark National Wildlife Refuge	Clatsop, Oregon	35,630	37,866	6%	2,236	6%	46,041	22%	22%
Little Pend Oreille National Wildlife Refuge	Pend Oreille, Washington	11,732	12,986	11%	1,254	10%	15,446	19%	19%
	Stevens, Washington	40,066	44,080	10%	4,014		52,751	20%	
Little White Salmon National Fish Hatchery	Skamania, Washington	9,872	11,074	12%	1,202	12%	12,998	17%	17%
Lookingglass Fish Hatchery	Union, Oregon	24,530	25,078	2%	548	1%	31,698	26%	29%
	Wallowa, Oregon	7,226	7,143	-1%	-83		9,338	31%	
Lower Klamath National Wildlife Refuge	Klamath, Oregon	63,775	67,542	6%	3,767	5%	82,411	22%	22%
	Siskiyou, California	44,301	46,217	4%	1,916		56,294	22%	
Lyons Ferry Fish Hatchery	Asotin, Washington	20,551	21,474	4%	923	4%	27,058	26%	26%
	Columbia, Washington	4,064	4,128	2%	64		5,351	30%	
	Franklin, Washington	49,347	73203	48%	23,856		64,971	-11%	
Magic Valley Fish Hatchery	Gooding, Idaho	14,155	15,200	7%	1,045	12%	19,011	25%	20%
	Twin Falls, Idaho	64,284	74,792	16%	10,508		86,336	15%	
Makah National Fish Hatchery	Clallam, Washington	64,525	71,585	11%	7,060	11%	84,954	19%	19%
Malheur National Wildlife Refuge	Harney, Oregon	7,609	7,266	-5%	-343	-5%	9,832	35%	35%
McCall Fish Hatchery	Valley, Idaho	7,651	9,486	24%	1,835	24%	10,276	8%	8%
McKay Creek National Wildlife Refuge	Umatilla, Oregon	70,548	73,475	4%	2,927	4%	91,163	24%	24%

Table 7. Population Change

Facility Name	Intersecting Counties and States	Population (2000 - 2008)					Projections (2008 - 2030)		
		2000	2008	% Change	Difference	Average Change by FWS Facility	2030	% Change	Median Change by FWS Facility
McNary National Wildlife Refuge	Benton, Washington	142,475	165,941	16%	23,466	12%	187,584	13%	18%
	Franklin, Washington	49,347	73,203	48%	23,856		64,971	-11%	
	Umatilla, Oregon	70,548	73,475	4%	2,927		91,163	24%	
	Walla Walla, Washington	55,180	58,981	7%	3,801		72,650	23%	
Minidoka National Wildlife Refuge	Blaine, Idaho	18,991	22,667	19%	3,676	3%	25,506	13%	31%
	Cassia, Idaho	21,416	21,721	1%	305		28,763	32%	
	Minidoka, Idaho	20,174	19,439	-4%	-735		27,095	39%	
	Power, Idaho	7,538	7,854	4%	316		10,124	29%	
Nestucca Bay National Wildlife Refuge	Tillamook, Oregon	24,262	26,232	8%	1,970	8%	31,352	20%	20%
Nisqually Fish Hatchery At Clear Creek	Pierce, Washington	700,820	803614	15%	102,794	15%	922,705	15%	15%
Nisqually National Wildlife Refuge	Pierce, Washington	700,820	803,614	15%	102,794	17%	922,705	15%	13%
	Thurston, Washington	207,355	246,792	19%	39,437		273,005	11%	
Oahu Forest National Wildlife Refuge	Honolulu, Hawaii	876,156	917,673	5%	41,517	5%	1,028,259	12%	12%
Oregon Islands National Wildlife Refuge	Clatsop, Oregon	35,630	37,866	6%	2,236	7%	46,041	22%	21%
	Coos, Oregon	62,779	64,582	3%	1,803		81,124	26%	
	Curry, Oregon	21,137	22,627	7%	1,490		27,313	21%	
	Lane, Oregon	322,959	346,633	7%	23,674		417,331	20%	
	Lincoln, Oregon	44,479	46,822	5%	2,343		57,476	23%	
	Tillamook, Oregon	24,262	26,232	8%	1,970		31,352	20%	
Oxford Slough Waterfowl Production Area	Bannock, Idaho	75,565	80,464	6%	4,899	10%	101,487	26%	22%
	Franklin, Idaho	11,329	12,871	14%	1,542		15,215	18%	
Pearl Harbor National Wildlife Refuge	Honolulu, Hawaii	876,156	917,673	5%	41,517	5%	1,028,259	12%	12%
Pierce National Wildlife Refuge	Skamania, Washington	9,872	11,074	12%	1,202	12%	12,998	17%	17%
Quilcene National Fish Hatchery	Jefferson, Washington	25,953	30,075	16%	4,122	16%	34,170	14%	14%
Quillayute Needles National Wildlife Refuge	Clallam, Washington	64,525	71,585	11%	7,060		84,954	19%	
	Jefferson, Washington	25,953	30,075	16%	4,122	13%	34,170	14%	16%
Quinault National Fish Hatchery	Grays Harbor, Washington	67,194	72241	8%	5,047	8%	88,468	22%	22%
Ridgefield National Wildlife Refuge	Clark, Washington	345,238	430,867	25%	85,629	14%	454,543	5%	13%
	Columbia, Oregon	43,560	49,719	14%	6,159		56,289	13%	
	Cowlitz, Washington	92,948	100,917	9%	7,969		122,376	21%	
San Juan Islands National Wildlife Refuge	San Juan, Washington	14,077	15,957	13%	1,880	13%	18,534	16%	16%
Sawtooth Fish Hatchery	Custer, Idaho	4,342	4208	-3%	-134	-3%	5,832	39%	39%

Table 7. Population Change

Facility Name	Intersecting Counties and States	Population (2000 - 2008)					Projections (2008 - 2030)		
		2000	2008	% Change	Difference	Average Change by FWS Facility	2030	% Change	Median Change by FWS Facility
Sheldon National Wildlife Refuge	Harney, Oregon	7,609	7,266	-5%	-343		9,832	35%	
	Humboldt, Nevada	16,106	17,546	9%	1,440	5%	24,696	41%	32%
	Lake, Oregon	7,422	7,489	1%	67		9,591	28%	
	Washoe, Nevada	339,486	430,741	27%	91,255		520,550	21%	
Siletz Bay National Wildlife Refuge	Lincoln, Oregon	44,479	46,822	5%	2,343	5%	57,476	23%	23%
Spring Creek National Fish Hatchery	Skamania, Washington	9,872	11,074	12%	1,202	12%	12,998	17%	17%
Steigerwald Lake National Wildlife Refuge	Clark, Washington	345,238	430,867	25%	85,629	25%	454,543	5%	5%
Toppenish National Wildlife Refuge	Yakima, Washington	222,581	238,474	7%	15,893	7%	293,052	23%	23%
Tualatin River National Wildlife Refuge	Washington, Oregon	445,342	530,596	19%	85,254	19%	575,475	8%	8%
Tucannon Fish Hatchery	Columbia, Washington	4,064	4,128	2%	64	2%	5,351	30%	30%
Turnbull National Wildlife Refuge	Spokane, Washington	417,939	459,933	10%	41,994	10%	550,262	20%	20%
Umatilla National Wildlife Refuge	Benton, Washington	142,475	165,941	16%	23,466		187,584	13%	
	Morrow, Oregon	10,995	12,325	12%	1,330	14%	14,208	15%	14%
Upper Klamath National Wildlife Refuge	Klamath, Oregon	63,775	67,542	6%	3,767	6%	82,411	22%	22%
Warm Springs National Fish Hatchery	Wasco, Oregon	23,791	24,296	2%	505	2%	30,743	27%	27%
Willapa National Wildlife Refuge	Pacific, Washington	20,984	21,889	4%	905	4%	27,628	26%	26%
Willard National Fish Hatchery	Skamania, Washington	9,872	11,074	12%	1,202	12%	12,998	17%	17%
William L. Finley National Wildlife Refuge	Benton, Oregon	78,153	83,564	7%	5,411		100,990	21%	
	Linn, Oregon	103,069	113,408	10%	10,339	8%	133,187	17%	19%
Winthrop National Fish Hatchery	Okanogan, Washington	39,564	40,905	3%	1,341	3%	52,090	27%	27%

Source: U.S. Census (2000, 2008 estimate update)

Planning

Data on completeness of Service plans is provided by FWS core team members. Data on the locations of non-service planning districts varies by state. In Washington, this information is in a GIS. However, other states require manual reference of published maps. MPO data is provided by BTS, however, many data gaps were found so the data cannot be considered a stand-alone MPO resource.

Partnerships

Because agencies at all levels are increasingly interested in pooling funds to improve assets that benefit multiple organizations, non-Service owned roads that intersect Region 1 units have been identified and summarized. These roads were located using a GIS's ability select by location for all US Census Tiger roads intersecting FWS boundaries. The results of this process are summarized in Table 8. Other data cited in the *Partnerships* section comes from the information established in *Planning*.

Table 8. Non-Service Roads Intersecting Service Units

State	Service Unit	Road Name
Hawaii	Oahu Forest National Wildlife Refuge	Kamehameha Hwy (State)
Idaho	Camas National Wildlife Refuge	I 15
	Clearwater Fish Hatchery	SR 7
	Clearwater Fish Hatchery	Cavendish Rd
	Grays Lake National Wildlife Refuge	Grays Lake Rd
		SR 34
	McCall Fish Hatchery	Lake St
	Minidoka National Wildlife Refuge	Baseline
		I 86
	Oxford Slough Waterfowl Production Area	Westside Hwy
	Sawtooth Fish Hatchery	SR 75
	Dworshak National Fish Hatchery	SR 7
Oregon	Ankeny National Wildlife Refuge	Ankeny Hill Rd
		Buena Vista Rd
		Wintel Rd
	Bandon Marsh National Wildlife Refuge	Bank Rd
	Cape Meares National Wildlife Refuge	Bayshore Dr
	Julia Butler Hansen Refuge For The Columbian White-Tailed Deer	Puget Island Ferry Xing
	Klamath Marsh National Wildlife Refuge	Silver Lake Rd
	Lower Klamath National Wildlife Refuge	The Dalles California Hwy
	Malheur National Wildlife Refuge	Diamond Ln
		Lava Beds Rd
		SR 205
		Frenchglen Hwy
	McKay Creek National Wildlife Refuge	Pendleton John Day Hwy
	McNary National Wildlife Refuge	Columbia River Hwy
	Nestucca Bay National Wildlife Refuge	Little Nestucca River Rd
		Old Woods Rd
		US 101

Table 8. Non-Service Roads Intersecting Service Units

State	Service Unit	Road Name
Oregon	Siletz Bay National Wildlife Refuge	US 101
		Oregon Coast Hwy
	Tualatin River National Wildlife Refuge	Oregon St
		Scholls Sherwood Rd
		Pacific Hwy
	Umatilla National Wildlife Refuge	Columbia Blvd
		Columbia Ln
		I 84
	William L. Finley National Wildlife Refuge	Bellfountain Rd
		Peoria Rd
		SR 99 w
Washington	Quilcene National Fish Hatchery	US 101
	Winthrop National Fish Hatchery	SR 20
	Little White Salmon National Fish Hatchery	SR 14
	Columbia National Wildlife Refuge	McManamon Rd
		SR 26
	Dungeness National Wildlife Refuge	US 101
	Franz Lake National Wildlife Refuge	Evergreen Hwy
	Grays Harbor National Wildlife Refuge	Airport Way
		SR 109
	Hanford Reach National Monument	SR 24
		SR 240
		SR 243
		Us Reservation Rd
	Julia Butler Hansen Refuge For The Columbian White-Tailed Deer	SR 4
	Little Pend Oreille National Wildlife Refuge	SR Colville Tiger
	Lyons Ferry Fish Hatchery	SR 261
	McNary National Wildlife Refuge	US 730
		US Columbia River
	Nisqually National Wildlife Refuge	110th Ave
		I 5
	Steigerwald Lake National Wildlife Refuge	Evergreen Blvd
		SR Lewis
	Toppenish National Wildlife Refuge	SR 22
		US 97
	Turnbull National Wildlife Refuge	Cheney Spangle Rd
		Jennings Rd
		Mullinix Rd
	Willapa National Wildlife Refuge	SR 103
		US 101

Source: U.S. Census Tiger/ESRI (2008)

Sustainability

Baseline conditions associated with sustainability represent topics of climate change, transit, and non-motorized access to Service lands and reduced fossil fuel consumption. These themes are captured in several baseline condition indicators, including:

- Vulnerability of Coastal Service Units to Sea Level Change
- Seismic Risk
- Air-Quality Non-Attainment
- Service Units Intersected by Transit

Vulnerability of Coastal Service Units to Sea Level Change

The baseline condition analysis asserts that service lands located near coastal areas may be at risk of environmental change due to sea level change. The analysis uses the USGS coastal vulnerability index (which factors tides, wave height, relative sea-level rise, coastal slope, geomorphology, shoreline erosion, and accretion rate) as a ranking of relative potential for coastal change due to future sea-level rise. The baseline conditions Coastal Vulnerability map identifies vulnerability rating for Service units within one mile of a Pacific Ocean shoreline. This information was derived by performing a GIS spatial join of Service unit boundaries with the USGS risk index dataset.

Seismic Risk

Seismic events have the potential for impacting transportation assets. Areas prone to severe seismic activity routinely plan for periodic damage in long range planning exercises. As such, the risk of seismic damage to Service transportation assets is considered in LRTP baseline conditions. USGS seismic risk data is used to identify the probability that seismic event will occur in 50 years is 10 percent or greater. This information was derived by performing a GIS spatial join of Service unit boundaries with the USGS seismic risk dataset.

Air Quality Non-Attainment

Because the Service is interested in helping to reduce emissions that contribute to global warming, locations identified as non-attainment areas by the EPA are identified in the baseline conditions section. A GIS was used to select any EPA non-attainment areas within one mile of a Service unit.

Service Units Intersected by Transit Districts

The Service wants to increase the use of transit by visitors to maximize person trips per vehicle mile traveled and lower emissions. As such, partnership with existing non-Service transit systems is viewed as an emerging opportunity for future transportation investment. Service units intersected by transit districts are summarized in the baseline conditions section. A GIS was used to select transit districts that intersect unit boundaries. A transit districts dataset was created by mining Google.com and cross referencing with state transit organization's websites.

Appendix D

Roadway Design Guidelines

Roadway Design Guidelines

Pacific Region

Primary Contact
Alex Schwartz, RLA
Landscape Architect, R1 Branch of Transportation
U.S. Fish and Wildlife Service
National Wildlife Refuge System
911 NE 11th Avenue
Portland, Oregon 97232-4181
Alex_schwartz@fws.gov
503/736 4723

Acknowledgements
Jeff Holm, Chief, R1 Branch of Transportation, Refuge Roads Coordinator R1 & R8
Mike Marxen, Chief, R1 Branch of Visitor Services and Communication
Charles Houghten, Chief, R1 Division of Planning, Visitor Services and Transportation

Special Thanks
Peter Field - Western Federal Lands, Federal Highway Administration
Doug Staller - Refuge Manager, Necedah NWR, FWS, R3
Sandra Jacobson - Wildlife Biologist, Pacific Southwest Research Station, U.S. Forest Service
Steve Suder - National Coordinator, Refuge Transportation Program, FWS
Eva Paredes - Refuge Roads Coordinator, FWS Region 6
Florian Schulz and Emil Herrera - Florian Schulz Photography (visionsofthewild.com)

Consultant Team
SvR Design Company
Tom von Schrader, PE
Nate Cormier, RLA
Justin Martin, ASLA

Quatrefoil, Inc.
Brian Bainnson, ASLA

Cover: Pronghorn antelope herd standing at the edge of a hill on sagebrush prairie. Pronghorn are one of many wildlife species found on FWS managed lands in Region 1 that are impacted by roadways.
Photo: Florian Schulz

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE 11th Avenue
Portland, Oregon, 97232-4181

In Reply Refer To:
NWRS-PVST

FEB 24 2011

Memorandum

To: All Region 1 Project Leaders

From: Regional Director, Region 1 Acting
Portland, Oregon

Subject: Pacific Region Roadway Design Guidelines

The Pacific Region's Roadway Design Guidelines (guidelines) document is attached for your use. The guidelines identify how we will deliver surface transportation and related improvements, consistent with the U.S. Fish and Wildlife Service's (Service) mission, on roads and lands managed by the Service in the Pacific Region. The guidelines are effective immediately.

A core team including project leaders and technical experts from the Region, and staff from the Federal Highway Administration developed the guidelines as a tool for interdisciplinary teams to use during roadway planning and design, and to support roadway development decisions. The team included state of the art ecological, planning, design, and engineering considerations in the guidelines that reflect both the significant benefits and impacts roadway projects present.

Informational sessions about the guidelines will be announced in the near future. If you have any questions contact Alex Schwartz, Landscape Architect, Division of Planning, Visitor Services, and Transportation, Branch of Transportation, at (503) 736-4723.

Attachment

Purpose

The U.S. Fish & Wildlife Service (FWS) is the world's premier conservation agency, managing over 150 million acres of wildlife habitat on National Wildlife Refuges alone. FWS is in a unique position to demonstrate the land ethic so deeply interwoven in the rich fabric of our national heritage.

This guide highlights state of the art ecological, planning, design and engineering considerations for roadway projects that heed both the significant benefits and impacts these projects present. Roadway projects on FWS managed lands should conform to planning and design criteria that have been established to support the FWS mission. This document provides such criteria in the form of guidelines. These guidelines are summarized in a table of contents that serves as a project checklist.

The Roadway Design Guidelines are a wayfinding tool intended to facilitate dialog and decision making among project teams. The guidelines have been crafted to support the interdisciplinary team typically involved with decision making regarding a roadway project: Project Leaders, Project Managers, and technical experts from various disciplines.

This document includes 30 individual project planning and design guidelines, organized around 6 major themes. The project checklist serves as an overview of these guidelines, and has been provided as a tool to assist in project planning, design and implementation.

In the pages that follow you will find information and resources that will be useful in your work on roadway projects. Using these guidelines is not an end in itself. Rather, the guidelines are a starting point from which to explore solutions to implement a roadway project of the highest standard. Every guideline begins with a brief discussion of the intent for presenting a particular topic, followed by supporting principles central to honoring the guideline, as well as associated metrics. Selected resources are provided to gain a deeper understanding of the topic.

Brian Bainnson

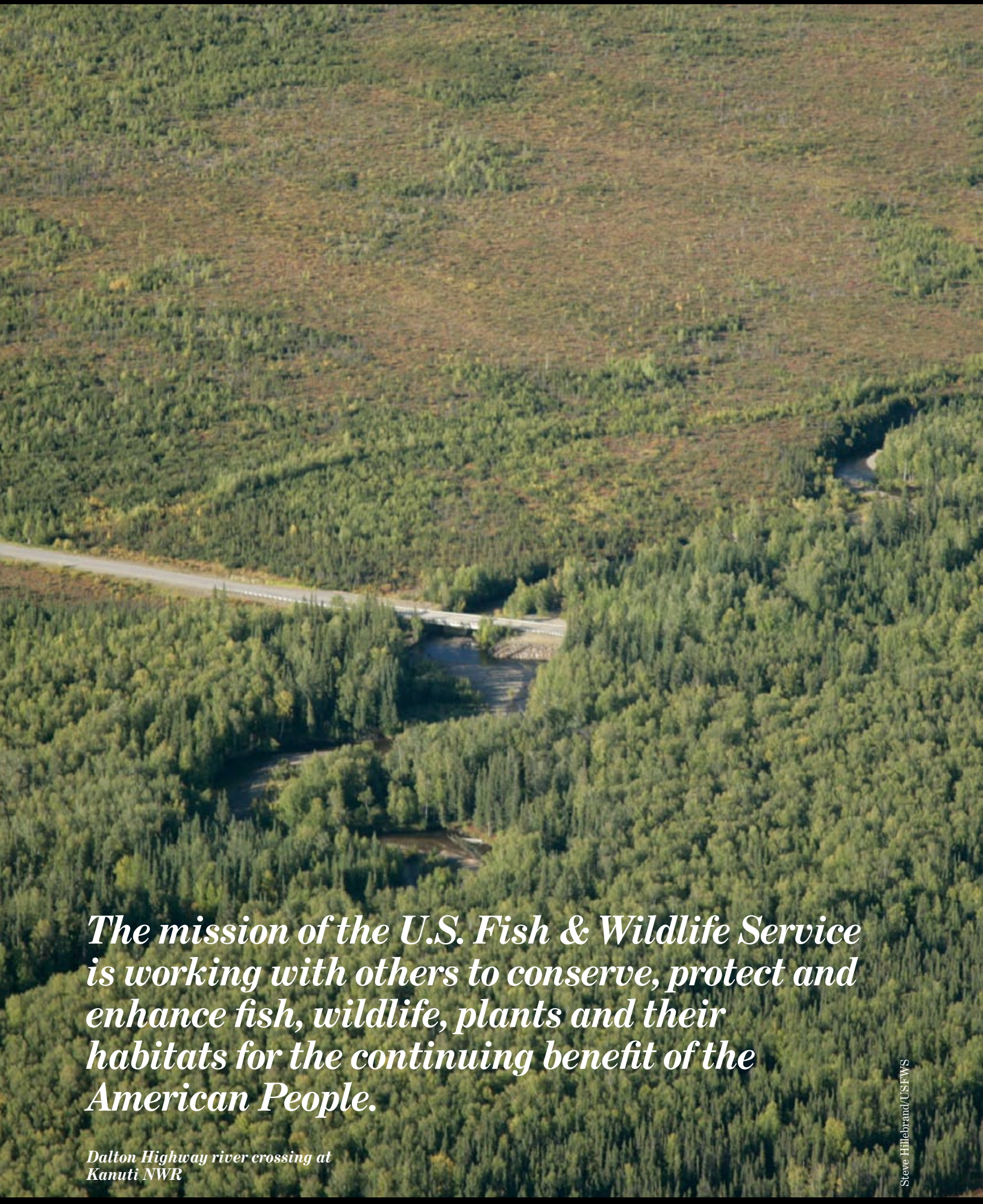
Eva Paredes/USFWS

Visitor contact facilities are often located in close proximity to roadways like this one at McNary National Wildlife Refuge (NWR) (top). Bison herd as viewed from roadway at the National Bison Range (bottom).

More Than Just A Road

A 'roadway' as referred to in these guidelines encompasses not only the suite of typical improvements associated with a vehicle-focused transportation project, but also related facilities such as parking, overlooks and the zone of ecological impacts from a road. These can be summarized as follows:

- **Typical transportation improvements** extend from the centerline of an existing or proposed road outward and include associated infrastructure components, such as paving, utilities, grading, drainage and planting.
- **Other facilities and infrastructure** commonly associated with vehicular transportation, include parking, visitor contact facilities, and pullouts.
- **Ecological connections and impacts** beyond the edge of the physical road or right of way, such as habitat fragmentation, habitat disturbance, pollution and aquatic and terrestrial species conflicts.



The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American People.

Dalton Highway river crossing at Kanuti NWR

Steve Hillebrand/USFWS

Project Checklist

LE – Landscape Ecology

- [ ] LE-1 Improve habitat connectivity
- [ ] LE-2 Reduce impacts to wildlife and habitat
- [ ] LE-3 Understand hydrologic processes of regional landscape
- [ ] LE-4 Respond to intrinsic qualities of regional landscape
- [ ] LE-5 Address climate change

PC – Planning Context

- [ ] PC-1 Review relevant planning, policy and regulatory information
- [ ] PC-2 Define level of service for the project
- [ ] PC-3 Evaluate multiple siting and alignment alternatives
- [ ] PC-4 Assess full costs and impacts of transportation system
- [ ] PC-5 Communicate with team and stakeholders

DE – Design and Engineering

- [ ] DE-1 Preserve and restore native vegetation and other natural resources
- [ ] DE-2 Consider and plan for invasive species management
- [ ] DE-3 Minimize cut and fill to fit with existing landscape
- [ ] DE-4 Consider road geometries for lower speeds, safety and alertness
- [ ] DE-5 Consider construction impacts and best practices
- [ ] DE-6 Consider range and sources of materials for sustainable construction
- [ ] DE-7 Consider maintenance

OP – Organism Passage

- [ ] OP-1 Develop your corridor plan for crossing
- [ ] OP-2 Provide and enhance aquatic organism crossings
- [ ] OP-3 Provide and enhance terrestrial wildlife crossings
- [ ] OP-4 Evaluate the need for wildlife fencing and other guiding features
- [ ] OP-5 Consider warning and safety systems for drivers

SM – Stormwater Management

- [ ] SM-1 Buffer habitat from polluted runoff
- [ ] SM-2 Protect habitat from erosive flows and flooding
- [ ] SM-3 Monitor and maintain stormwater facilities
- [ ] SM-4 Promote stewardship of aquatic resources

VE – Visitor Experience

- [ ] VE-1 Preserve and highlight scenic value
- [ ] VE-2 Promote and facilitate multiple modes of transportation
- [ ] VE-3 Comply with accessibility standards and guidelines
- [ ] VE-4 Facilitate compatible wildlife dependent recreation and education

Highway through Siletz Bay NWR provides travelers with visual access to the Refuge. The highway affects habitat connectivity and the landscape's hydrology.

David Pitkin/USFWS

Landscape Ecology

Landscape Ecology
Overview

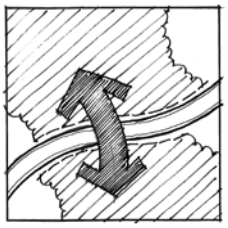
Pattern and Process
Roads and ecological function are intrinsically intertwined. Roadways on FWS managed lands in particular are frequently located in areas of high ecological importance.

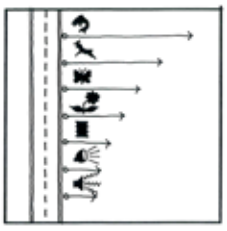
This section, Landscape Ecology, is intended to help you consider the broad-scale environmental impacts of your decisions regarding roadways and transportation infrastructure. It addresses a range of issues, providing you with a set of tools for decision-making.

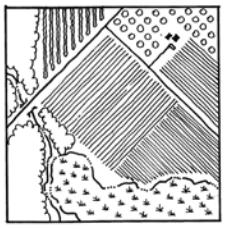
Any new roadway construction or improvements to existing roadways on FWS managed lands requires unique treatment, consistent with the mission of the Service and supported by a detailed understanding of refuge management goals. Improvements need to be made in a manner consistent with applicable laws such as the Migratory Bird Treaty Act (MBTA), Fish and Wildlife Coordination Act (FWCA), Bald and Golden Eagle Protection Act (BGEPA) and Endangered Species Act (ESA). While the guidelines in this section cover principles which are, in general, applicable across a broad range of environments, take time to consider the guidelines and their specific implications within the unique bioregional context in which your projects will occur.

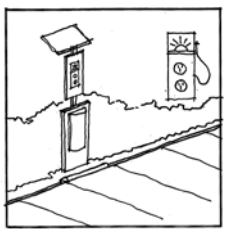
Research in the field of road ecology demonstrates that the multitude of adverse impacts of roads on landscapes, and the healthy function of the natural systems they traverse, are reduced by designing for slower travel speeds and lower traffic volume.

A significant component of a roadway project may be to remove roads from ecologically sensitive areas and restore those areas.









Landscape Ecology 101

Landscape ecology is the study of the relationship between spatial pattern and ecological processes on a wide variety of landscape scales and organizational levels. Some key landscape ecology concepts are:

Patch - Distinct area of a particular habitat or landscape type. Key considerations include size, number, location, and composition/contents. Small patches have a higher edge-to-interior ratio; some species thrive on edges, while others strictly prefer the qualities of a patch interior.

Edge - The shape, width, straightness, and other qualities of habitat or patch edges affects their performance and utility for various species.

Connectivity - This depends on distance, as well as other factors that may promote or inhibit movement between patches. A roadway may seem relatively narrow, but constitute a greater barrier than a broad field for some species.

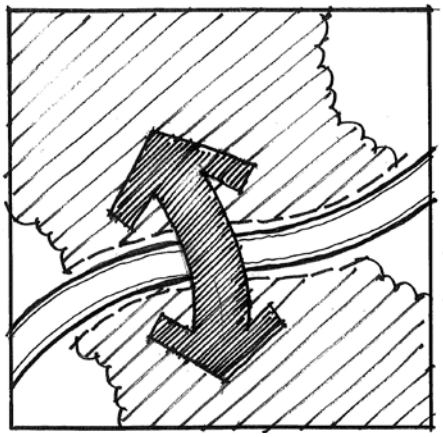
Mosaic - The bigger picture that includes the various patches and the matrix that contains them (e.g. areas of remnant woodland and wetlands, within a matrix of agricultural fields). Key elements include scale, grain (coarseness), patch diversity, and degree of fragmentation.

Roads form a **network**, which may be viewed as a **matrix** that contains a variety of habitat patches. They significantly affect connectivity, creating abrupt and harsh edge conditions, whose effects (such as light, noise, air quality, temperature, hydrology) can extend well into the adjacent habitat patches.

LE-1 Improve Habitat Connectivity

Intent

Roadways should be examined for their potential to impact habitat connectivity. Wherever possible such impacts should be minimized and/or mitigated. When a contiguous habitat area is bisected by a roadway, abrupt edge conditions are created. Such habitat fragmentation is generally undesirable. Hydrologic and soil community connectivity are also affected. Native plantings and other restoration activities associated with roadway improvements can be designed to support multiple habitat objectives, including buffering patch interiors and mitigating roadway impacts. In rare instances, roadway corridors may also serve as habitat connectors, linking otherwise fragmented communities.



Habitat connectivity is disrupted along any road corridor

Principles

- Identify and prioritize habitat restoration and connectivity opportunities at the landscape scale
- Review state habitat connectivity plans as well as applicable recovery plans for listed species
- Consider impacts and footprint of the entire roadway as defined in these guidelines
- Develop partnerships among land management agencies and the local FWS Ecological Services (ES) office
- Partner with neighbors
- Identify opportunities for individual projects to minimize impacts to wildlife and restore habitat connectivity

Metrics

- Trends in species mortality, avoidance, low population survival, sensitive or endangered species populations
- Decreased wildlife-vehicle collisions and/or roadway avoidance
- Distance between habitat patches
- Distribution of species/population along and across roadway

Resources

Overview of road ecology and guidelines for ecological road planning and design.

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions.

Graphic explanations of landscape ecology principles.

Dramstad, Olson, and Forman. 1996. Landscape Ecology Principles in Landscape Architecture and Land-Use Planning.

Discussion of positive and negative impacts of roadways on adjacent vegetation.

Forman, Richard. 2002. "Roadsides and Vegetation." In Proceedings of the International Conference on Ecology and Transportation, Keystone, CO, September 24-28, 2001.

Roadway design guidelines from applied ecology and experiential perspective.

Jones, Grant R., et al. 2007. Applying Visual Resource Assessment for Highway Planning (pp.130-139) and Road Alignment (pp.330-341). In Landscape Architecture Graphic Standards.

Effects of roadways on wildlife (see also entire February 2000 Conservation Biology issue).

Trombulak, Stephen and Christopher Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities.

Wildlife conservation and planning efforts among the western states.

Western Governors' Wildlife Council. http://www.westgov.org/. Resources include the Wildlife Corridors Initiative Report (2008) and Wildlife Sensitivity Maps.

Habitat Connectivity

Habitat connectivity is a term commonly used in landscape ecology to describe the degree of connection between nearby or adjacent habitat areas. Distinct habitat areas are frequently referred to as 'habitat patches'. If the connection between these patches is not good, the resultant fragmentation can lead to loss of diversity within a given population of a species and potentially local extinction of that species from one or both patches. Even for fairly mobile species, a roadway can present a significant barrier to movement between patches.

Terrestrial under-crossing facilitates wildlife movement across a landscape fragmented by a highway in Banff NP, Canada

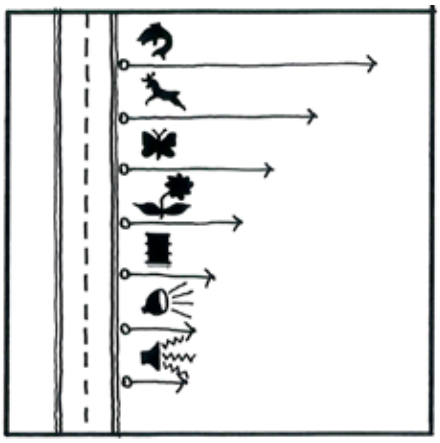
Patricia White/Flickr.com

LE-2 Reduce Impacts to Wildlife and Habitat

Intent

Roads have a significant impact on wildlife populations and habitat. Roads can directly impact wildlife through mortality (e.g. wildlife-vehicle collisions), roadway avoidance, habitat loss and habitat fragmentation. Wildlife-vehicle collisions are a safety concern for motorists. Traffic volume and roadway type directly relate to the severity of wildlife impacts. Roadkill data alone is not an accurate indicator of roadway impacts to wildlife, due to avoidance behavior and other issues. Mortality and avoidance are two species-dependent outcomes that may result from the barrier effect a roadway has on wildlife. In addition, maintenance practices, in combination with abundant edge habitat, can attract certain species of wildlife to a roadway, increasing the potential for conflict.

Consider roadway alignment, design, construction, and future maintenance methods that create the least detrimental impact to wildlife and habitats. Section OP (Organism Passage) discusses terrestrial and aquatic organism passage in more detail.



Impacts to wildlife and habitat extend outward from the roadway in various degrees, creating the 'road-effect zone'.

Principles

- Identify and limit the 'road-effect zone' and determine the potential exposure of ESA listed species and critical habitat to road effects within that zone. Minimize adverse effects to ESA listed species and critical habitat, and ensure any such effects are addressed through the ESA section 7 compliance process, as appropriate.
- Design for lower speeds, in order to minimize disturbance
- Consider management techniques to minimize disturbance to wildlife on auto tour routes
- Examine how road alters wildlife use patterns
- Examine how future effects on wildlife could make a project compatible (or not) with management goals
- Consider effects of noise, light and chemical pollution on habitats and wildlife

Metrics

- Reduction of wildlife-vehicle collisions
- Health of wildlife populations with habitats fragmented by or in proximity to roadways
- Road density (landscape ecology metric, see Definitions)
- Mesh size (landscape ecology metric, see Definitions)

Resources

Overview of road ecology, guidelines for ecological road planning and design. See especially discussion of road-effect zones, pp. 306-16.

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions.

Latest information on road ecology as it relates to mitigating interactions between roads and wildlife.

Beckmann, J. P., et al. 2010. Safe Passages.

Identifying & prioritizing habitat connectivity zones, and guidelines for design solutions.

FHWA. 2008. Best Practices Manual, Wildlife Vehicle Collision Reduction Study (Report to Congress).

Effects of roadways on wildlife (see also entire February 2000 Conservation Biology issue).

Trombulak, Stephen and Christopher Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities.

Buffer design guidelines.

Bentrup, G. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Access at: http://www.unl.edu/nac/bufferguidelines/

See also:

Section OP - Organism Passage

Roadways have significant impacts on both individuals and populations.

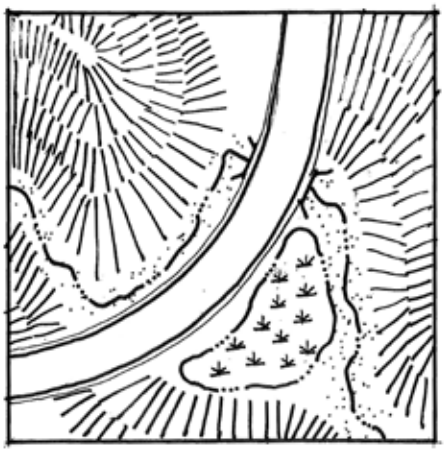
Mac Danzig Photography

Florian Schulz

LE-3 Understand Hydrologic Processes of Regional Landscape

Intent

Roadways can have dramatic impacts on hydrology at local, regional, and watershed scales. Disturbance to local hydrology is one negative impact to habitat caused by roadways. Impervious surfaces have a cumulative effect across a watershed, altering its hydrology and often creating detrimental consequences for wildlife. In some cases, the effects of a roadway on hydrology may be desired as part of a field station's approach to habitat management. Project teams should consider carefully how a roadway will impact local hydrology, or conversely how hydrologic processes can inform design decisions. Roadway improvements might support FWS management goals by addressing known issues and/or restoring historic hydrologic processes.



Roadways disrupt natural hydrology.

Principles

- Consider how road design may protect hydrologic processes
- Consider how to adapt an existing roadway for greater permeability
- Consider what effects the roadway might have on subsurface flows, water tables, and nearby aquifers, as well as how these elements affect construction options and feasibility
- Consider balance between restoring to pre-development conditions and maintaining historic alterations to hydrology
- Consider how development and roadway work will support current hydrologic and habitat management goals

Metrics

- Hydrologic modeling showing potential changes from roadways
- Stream flow data
- Changes in species composition (invasives vs. natives)

Resources

General reference on road ecology. See in particular overview of roadway effects on hydrology in Chapter 7.

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions. Island Press. Washington D.C.

Guidelines that address hydrology impacts of roadways.

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Design guidelines for low-use roads, focusing largely on hydrology.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Roadway design guidance for lower impact to hydrology.

Dashiell and Lancaster. Undated. Road Design Guidelines for Low Impact to Hydrology. Five Counties Salmonid Conservation Program. Weaverville, CA.

Guidebook on design and best practices for providing aquatic organism passage.

USDA Forest Service. 2008. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings.

See also:

Section SM - Stormwater Management

Roads both affect and are affected by hydrology. Floodwaters wash out a road at Flint Hills NWR (top); levee road at Blackwater NWR (bottom).

Eva Paredes/USFWS

Leon Reed/Flickr.com

LE-4 Respond to Intrinsic Qualities of Regional Landscapes

Intent

Every landscape has a rich natural and cultural history, a distinct composition of flora and fauna, unique weather, drainage patterns and views. Such intrinsic qualities contribute to each location's "sense of place," or context, which should be a guiding factor in work there. A contextual approach should be taken when planning and designing all roadways on FWS lands, and should be used for such decisions as road alignment and location of visitor facilities. Consider local vernacular architecture and land management traditions (e.g. local historic and sustainable agricultural practices), aesthetic issues such as viewsheds and practical issues such as seasonal access to recreational opportunities.

Principles

- Consider Context Sensitive Solutions (CSS) for general design guidelines and engage a landscape architect
- Develop benchmarking tools for ecological performance
- Consider what local land use traditions are consistent with FWS goals and management activities
- Respond to visual appearance of regional landforms, vegetation, and other natural features
- Review historic land use patterns and cultural practices
- Consider visitor experience and potential educational and interpretive benefits of road and visitor facility designs

Metrics

- Visitor satisfaction
- Ecological literacy of visitors
- Documentation of visual analysis (visual resource assessment) process (see Resources below)

Resources

Context-sensitive highway planning and design case study.

Kentucky Transportation Center. Undated. Context-Sensitive Design Case Study No. 1: Paris Pike - Kentucky.

Performance metrics for CSS design.

TransTech Mgmt., Oldham Historic Properties Inc., and Parsons Brinckerhoff Quade & Douglas for National Cooperative Highway Research Program. 2004. Performance Measures for Context Sensitive Solutions - A Guidebook for State DOT's.

Items to address or consider.

ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Roadway design guidelines from applied ecology and experiential perspective.

Jones, Grant R., et al. 2007. Applying Visual Resource Assessment for Highway Planning (pp.130-139), and Road Alignment (pp.330-341). In Landscape Architecture Graphic Standards. Available at: http://www.jonesandjones.com/news/publications.html.

Guidelines for visual and context considerations for roadway design.

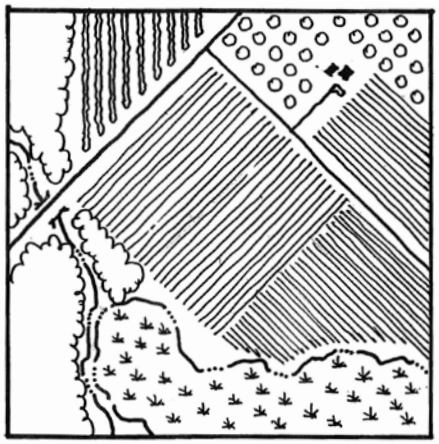
USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Transportation Research Board of The National Academies. 2002. A Guide to Best Practices for Achieving Context Sensitive Solutions (NCHRP Report 480).

Regional design guidelines.

New Mexico Department of Transportation. 2006. Architectural and Visual Quality Design Guidelines for Context Sensitive Design and Context Sensitive Solutions.

Nevada Department of Transportation. 2002. Pattern and Palette of Place: A Landscape and Aesthetic Master Plan for the Nevada State Highway System.



Historic land use patterns and natural features can help drive design.

Context Sensitive Solutions

The term Context Sensitive Solutions (CSS) refers to a decision-making process used by roadway designers and transportation engineers that accounts for many factors of a site's context—from topography and geology to cultural history and the intended users—during the planning, design, and maintenance of transportation facilities. Landscape architects played a leading role in developing this concept and are valuable team members for their expertise in determining how a project can appropriately respond to its context. Fundamental landscape architecture capabilities include identifying and expressing in built form the intrinsic qualities of a project's regional landscape.

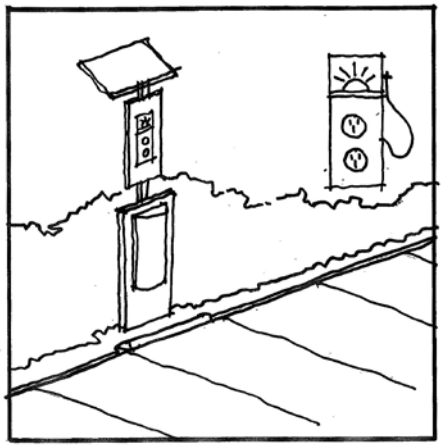
Leota Butte overlook at Ouray NWR provides an excellent landscape view.

Eva Paredes/USFWS

LE-5 Address Climate Change

Intent

Responding to climate change is a growing imperative for land managers and natural resource professionals, as well as the transportation and infrastructure sectors. Roadways on FWS managed lands may be particularly impacted because many are often in or near tidal zones, wetlands and floodplains. Factors to consider include how might roadways and visitor facilities be planned to reduce vehicle miles traveled (for visitors and staff); how will the roadways likely be impacted by changing weather and hydrologic patterns; and how might roadways be designed in a resilient and multifunctional manner that serves not only transportation, but perhaps other purposes such as protecting valuable facilities or habitat.



Facilitate greener transportation options.

Principles

- Provide alternative modes and means of access to FWS managed lands
- Consider potential climate change impacts when making decisions on location, scale and design life of infrastructure investments
- Consider construction materials and methods that have lower carbon footprints and climate impacts consistent with FWS and Department of the Interior (DOI) policies
- Use climate change research to inform transportation planning efforts at the landscape scale

Metrics

- Regional trends in weather-related damage and maintenance needs
- Vehicle miles traveled (VMT) on FWS roadways and associated greenhouse gas emissions
- Transportation modes used by visitors to reach and use FWS facilities
- Reports and data from the Emergency Relief for Federally Owned Roads (ERFO) program

Resources

Overview of transportation industry connection with climate change.

Transportation Research Board. 1997. Toward A Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology (SR 251).

Potential climate impacts of transportation sector and work towards reducing them.

Sperling, Daniel and Deborah Gordon. 2008. Two Billion Cars: Transforming a Culture. In: TR News, No. 259 (Nov-Dec).

Overview of general impacts of climate change on transportation infrastructure.

Transportation Research Board. 2008. Potential Impacts of Climate Change on US Transportation (TRB Report 290).

Regionally specific climate change impact information.

Climate Impacts Group. 2009. The Washington Climate Change Impacts Assessment.

Information, resources and organizations relating to sustainable transportation systems.

Green Highways Partnership. http://www.greenhighwayspartnership.org.

Assistance with emergencies and data on federally owned roads.

Emergency Relief for Federally Owned Roads (ERFO). http://flh.fhwa.dot.gov/programs/erfo/.

Official FWS climate change information and strategy.

http://www.fws.gov/home/climatechange/.

Climate change will impact roads on FWS managed lands. Road damage due to flooding at Arrowwood NWR (top); washed out bridge at Flint Hills NWR (bottom).

Eva Paredes/USFWS

Eva Paredes/USFWS

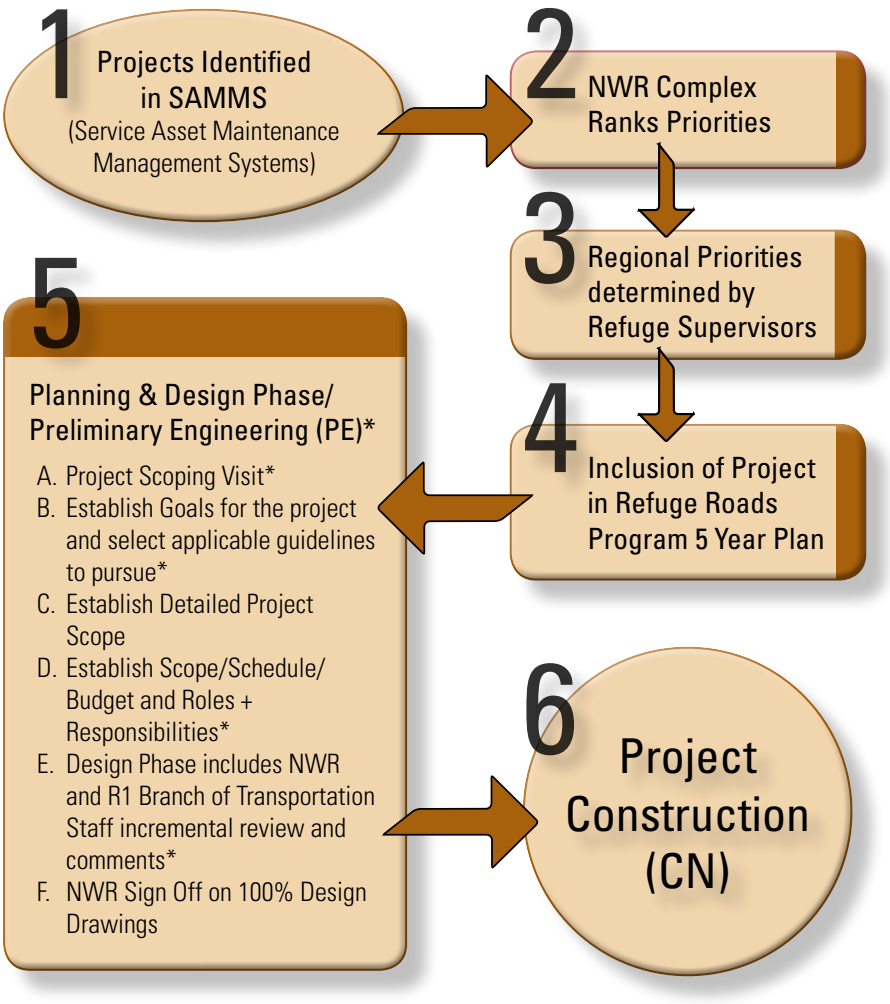
Planning Context

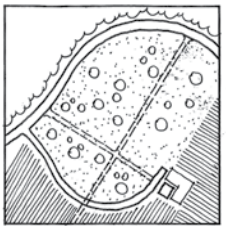
Planning Context
Overview

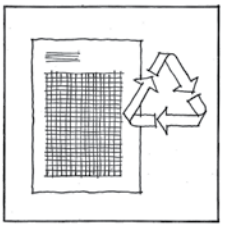
Planning the Process
Guidelines in this section are intended to help you consider a roadway project in a broad context before advancing to the specifics of site design and engineering presented in sections DE, OP, SM and VE of these guidelines. It is important to consider how a particular project fits into the Pacific Region's infrastructure, management and public access priorities, and how it might be most compatible with the conservation of listed species, the recovery function of critical habitat, and/or the conservation of FWS trust resources. Consider how the access a roadway enables and the impacts a roadway creates will fit into the management goals for the FWS managed lands it serves. The planning process can also help ensure that all applicable laws (e.g., FWCA, ESA, etc.) are appropriately addressed.

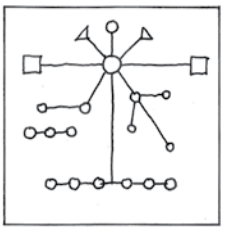
This section will help guide you to resources that will aid with or inform the planning process, as well as relevant documents that should be reviewed. It also serves as a reminder for project elements that are sometimes overlooked, such as developing a communications plan that addresses both internal and external communications about the project.

Typical FWS Region 1 Refuge Roads Project as delivered in partnership with the Federal Highway Administration (FHWA)









* Denotes the phase where the Roadway Design Guidelines are being used by the project team

PC-1 Review Relevant Planning, Policy and Regulatory Information

Intent

Take advantage of lessons learned and research in relevant fields. Reviewing relevant background information ensures your project team is considering the most advanced and applicable contextual information related to a specific project. Consider what applicable legal and FWS policy requirements your project must respond to in order to be successful.

Principles

- Review local, regional and state transportation plans to determine how efforts by other agencies may inform your project planning and design
- Contact GIS staff to initiate data gathering and discuss mapping and analysis needs
- Review your Comprehensive Conservation Plan (CCP) and step down plan sections on transportation planning
- Conduct survey work and geotechnical investigations
- Review the Regional Long Range Transportation Plan (LRTP)
- Review existing asset management data and any asset management plans
- Review requirements of NEPA as well as other applicable state and local regulations
- Address ESA requirements as applicable
- Ensure consistency with applicable environmental laws such the FWCA, MBTA, and BGEPA.

Metrics

- List of related documents or case studies reviewed
- Concurrence from project team and stakeholders that relevant information has been reviewed and is ready to be applied to future phases of work

Resources

Overview of various systems of performance metrics.

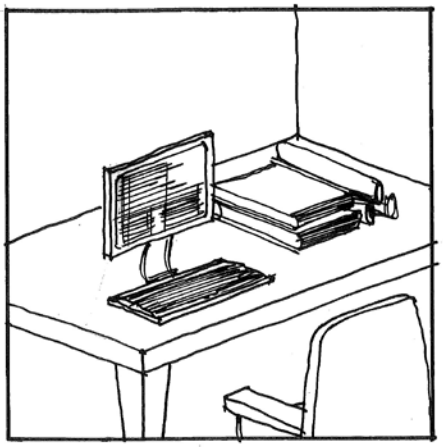
AASHTO. 2008. Guidelines For Environmental Performance Measures. NCHRP 25-25, Task 23. Prepared by Cambridge Systematics, Inc. Cambridge, MA.

NEPA information for EPA Region 10 (Pacific NW).

http://yosemite.epa.gov/R10/ECOCOMM.NSF/webpage/national+environmental+policy+act.

Guidelines for developing projects that work for local communities.

WSDOT. 2003. Building Projects that Build Communities: Recommended Best Practices.



Use in-house and online resources to find relevant case studies and up-to-date regulatory requirements.

Documents are shared and discussed during a project kickoff meeting at Umatilla NWR (top); a multidisciplinary team reviews resource documents during a project meeting in the Regional Office (bottom).

USFWS

Brian Baimson

PC-2 Define Level of Service for the Project

Intent

Your project team should identify what level of service (LOS) will be provided by roadways. This will help to adequately size facilities and ensure facility compatibility with current and anticipated demand. Designing for an appropriate LOS helps avoid over-building facilities, which can be costly. Plan to balance roadway improvements with wildlife conservation and habitat maintenance goals. Good phasing plans and cost estimates should be developed, keeping in mind that these may change over time, in response to changing visitor patterns, management priorities, or adjacent land use.

Principles

- Develop performance based, rather than prescriptive, goals and objectives
- Avoid unnecessarily over-designing facilities
- Consider utilizing partnerships and alternative transportation to accommodate special events that generate traffic or atypical demands on roadways
- Determine jurisdiction
- Decide whether roadways should enable more direct access to facilities or amenities
- Balance needs with resources and intended capacity and vehicle or user types
- Decide if and how it may be appropriate to promote lower design speeds
- Consider seasonal and multi-modal issues
- Examine case studies for other similar facilities in order to "right size" your facility for current and anticipated demands
- Consider Intelligent Transportation Systems (ITS) or other means of sharing traveler information to distribute traffic, inform visitors of seasonal closures and provide more trip planning
- Consider how the roadway can serve as a link to communities – gateways, access, etc.

Metrics

- Visitor use statistics (vehicle and trailhead)
- Visitor satisfaction
- Traffic and parking violations
- Traffic or congestion statistics
- Existing parking and roadway capacity

Resources

Design recommendations for various road types.

National Park Service. 1984. Park Road Standards.

Design recommendations for various road types.

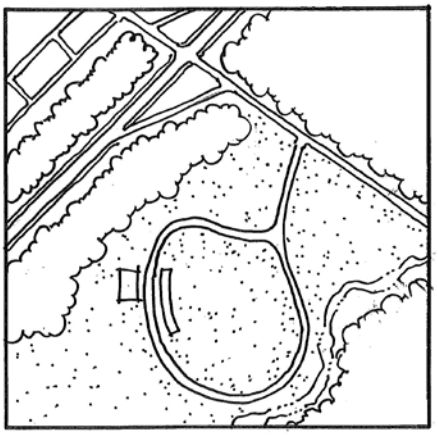
USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Regional guidelines for roadside development.

ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Public involvement may help clarify visitor needs.

Peaks, Harold E. and Sandra Hayes. 1999. "Building Roads in Sync With Community Values." In Public Roads (Mar./Apr. 1999).



Determine the intended vehicles and traffic volumes for the roadway.

Level of Service

The term Level of Service (LOS) is commonly used among transportation planners to refer to the number of vehicles served. However users of these guidelines should also consider the term to include other elements, such as types of users, seasonality of use and modes of transportation that a particular roadway serves. Multimodal access refers to the ability of a transportation facility to provide access via a variety of modes, such as car, bicycle, public transit or walking. In keeping with the FWS mission, consider where it is possible and appropriate to provide multimodal access to FWS facilities, and whether the scale and type of roadway is in line with local management objectives.

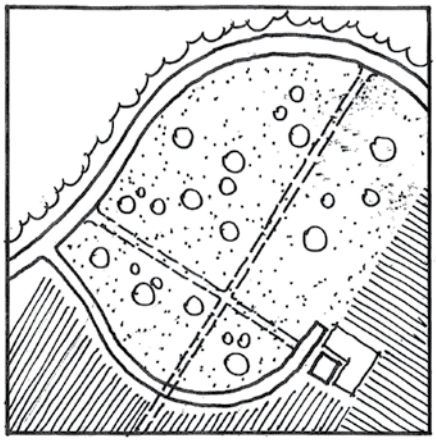
Wide gravel shoulder allows visitors to pull off of a 2-lane highway to view wildlife.

USFWS

PC-3 Evaluate Multiple Siting and Alignment Alternatives

Intent

Project teams should explore multiple design alternatives for roadway projects. A systematic alternatives evaluation process can be effectively used to arrive at a preferred alternative for further development. Alternatives development can reveal opportunities for projects to enhance visitor experience, protect wildlife, reduce ecological impacts to landscapes, minimize habitat fragmentation and provide alternative transportation methods. Reviewing a suite of alternatives will ensure that roadway decisions are compatible with the Service's mission and are made using the best possible information. The evaluation of alternatives will also support your NEPA process.



Explore and assess the effects of alternative road alignments.

Principles

- Determine if a roadway or road improvement is necessary
- Consider whether the roadway is in the right place
- Consider physical elements (e.g. hydrology), ecological effects (e.g. habitat fragmentation) as well as experiential factors (e.g. views, openness, arrival experience)
- Consider appropriateness of existing alignments versus potential alternatives
- Consider benefits or drawbacks of decommissioning existing facilities
- Determine how and when vehicles and people will move through the FWS managed lands
- Consider alternative modes of travel and potential for facility conversion, such as road to trail, trail in lieu of road, etc.
- Determine whether funding is tied to existing facilities

Metrics

- Comparison of road density for options considered
- Analysis of potential habitat fragmentation (e.g. vegetation or habitat mapping, wildlife tracking)

Resources

Case Studies.

Conboy Lake NWR, Visitor Experience Site Plan. Evaluated multiple vehicular and pedestrian circulation routes at HQ site. Contact Alex Schwartz, Project Manager (503/736 4723) for more information.

Umatilla NWR, McCormack Unit, Quarters Area Site Plan. Evaluated multiple roadway realignment concepts in conjunction with a new bunk house and residence. Contact Alex Schwartz, Project Manager.

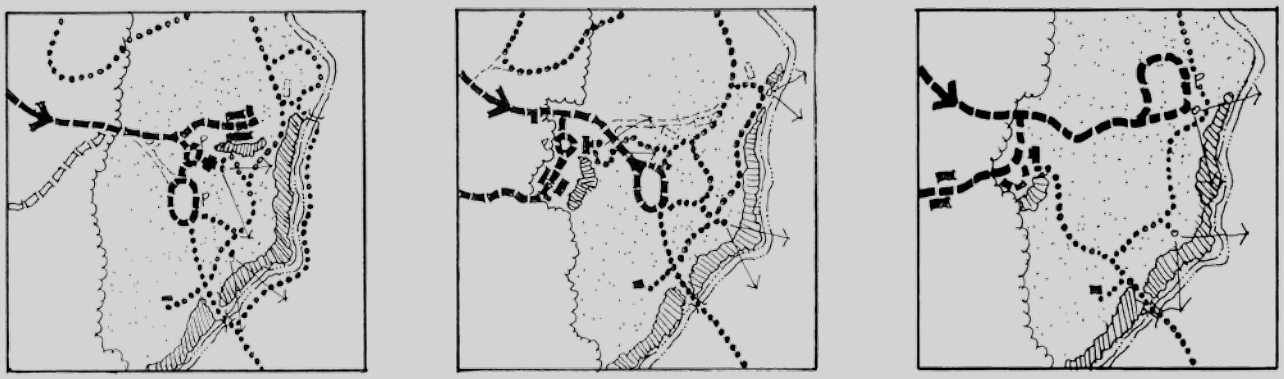
Roadway design guidelines using applied ecology and experience.

Jones, Grant R., et al. 2007. Applying Visual Resource Assessment for Highway Planning (pp.130-139) and Road Alignment (pp.330-341).

A decommissioned roadway is restored with native vegetation.

SvR Design

Evaluate Alternatives

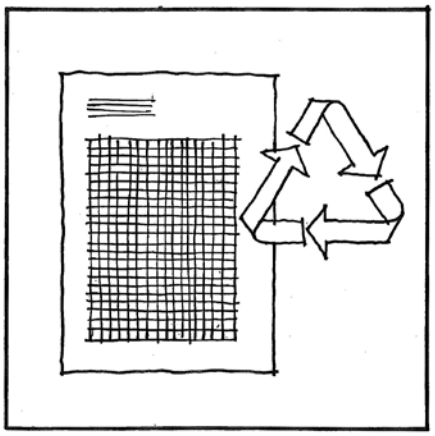


Conceptual site planning at Conboy Lake NWR evaluated three different alternatives for roadways on the site.

PC-4 Assess Full Costs and Impacts of Transportation System

Intent

Examine the full suite of costs associated with a roadway project in addition to the traditional design and construction costs. Consider the environmental impacts of the construction process and materials used, as well as future maintenance needs and costs. Projects that make sense in the near-term may not be environmentally beneficial or economically tractable in the long-term. Consider both environmental and monetary costs. Check resources for assigning monetary value to environmental costs.



Examine the characteristics of materials used in a project, including embodied energy and recyclability.

Principles

- Environmental impacts should be considered
- Evaluate the embodied energy of materials used
- Minimize externalization of environmental impacts through emissions and materials used
- Include comparison of costs of facilities for alternative modes of transportation in analysis
- Consider projected maintenance costs (often 65% of life cycle cost of an asset)

Metrics

- Carbon footprint (or ecological footprint)
- Vehicle miles traveled
- Long-term maintenance costs
- Life of pavement and other materials
- Greenroads rating system
- Life cycle costing (of total costs for construction and maintenance of a proposed transportation alternative)

Resources

Overview of various systems of performance metrics.

AASHTO. 2008. Guidelines For Environmental Performance Measures. NCHRP 25-25, Task 23.

Performance metrics for CSS.

TransTech Mgmt., et al. 2004. Performance Measures for Context Sensitive Solutions - A Guidebook for State DOT's.

Info & data on sustainable material.

Calkins, Meg. 2009. Materials for Sustainable Sites.

Overview of climate change impacts on transportation infrastructure.

Transportation Research Board. 2008. Potential Impacts of Climate Change on US Transportation.

Sustainability metrics.

University of Washington and CH2MHill. 2009. Greenroads Rating System, v1.0. http://www.greenroads.us/.

Example of triple bottom line assessment of infrastructure.

Stratus Consulting. 2009. A Triple Bottom Line Assessment of Traditional and Green Infrastructure ... in Philadelphia's Watersheds.

Triple Bottom Line in Transportation Management

The triple bottom line concept originates in business and accounting practices. It stipulates three key areas or 'resources' that should be addressed in measuring sustainability:

- Society (human capital)
- Environment (natural capital)
- Economy (financial capital)

This concept, also known as "people, planet, profit," offers an expanded spectrum of values and criteria for measuring a project or organization's success. Using this perspective in transportation management means that you would not only consider the long-term economic costs and benefits of a project, but also account for potential environmental and social costs and benefits over time.

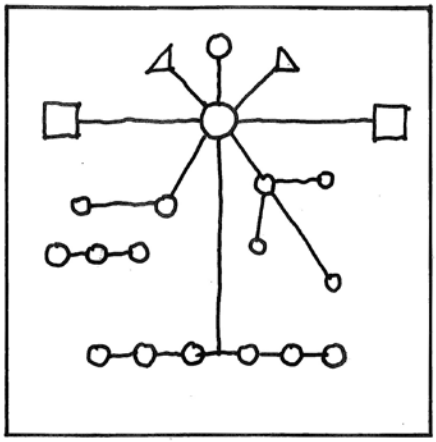
Road construction at Flint Hills NWR.

USFWS

PC-5 Communicate With Team and Stakeholders

Intent

Craft and document your approach for communications among your project team and with stakeholders. Ensure that roles and responsibilities are clearly defined in a project management plan. Carefully coordinate communications to help ensure consideration of a broad range of solutions in support of the best possible design outcome. Interdisciplinary project teams are the modern standard to ensure that work products are comprehensive and meet multiple objectives. Ensure that various elements of design are not overlooked and that there is organizational and public buy-in. Provide appropriate opportunities for involvement and review among your project team and stakeholders.



Develop a communications strategy and network.

Principles

- Address both internal and external communication needs in your project management plan
- Define clear roles and responsibilities for members of the project team
- Designate key agency contact(s) for all agencies/organizations involved
- Create a cross-functional (multi-disciplinary) team
- Develop design visualization and communication tools, such as graphics, plans, models, newsletters, web pages
- Identify the audience and develop solutions for communicating with people who don't read plans or technical documents
- Coordinate with transportation planning partners
- Contact Transportation Biologists in Ecological Services (ES) State Field Office to ensure project delivery is consistent with the mission of the Service
- Schedule project team meetings at regular intervals

Metrics

- Character and amount of public feedback on project
- Level of support and understanding of project within the organization
- Achievement of project goals

Resources

Guidelines for community and interdisciplinary planning process.

Lennertz, Bill, and Aarin Lutzenhiser. 2006. The Charrette Handbook. American Planning Association.

Case studies in collaborative management of wetlands and wildlife areas.

Porter, Douglas, and David Salvesen, eds. 1995. Collaborative Planning for Wetlands and Wildlife: Issues and Examples.

Public involvement for CSS.

Myerson, Deborah L., AICP, 1999. Getting It Right in the Right-of-Way: Citizen Participation in Context-Sensitive Highway Design. Scenic America. Available at: http://www.scenic.org/.

Public involvement for transportation projects.

Florida Department of Transportation. 2003. Public Involvement Handbook. Available at: http://www.dot.state.fl.us/EMO/pubs/public_involvement/pubinvolve.htm.

Members of Your Team

There are many professionals and stakeholder groups that you may want to include as part of your project team. Some possibilities include:

- Professional Engineers (PE)
- Landscape Architects (RLA)
- Transportation and Natural Resource Planners
- Field Biologists
- Project Leaders and Refuge Managers
- Refuge Roads Coordinators
- ES Transportation Biologists
- Representatives of other jurisdictions and agencies with local involvement

USFWS

Project staff and stakeholders meet in the field at Pelican Island NWR (right).

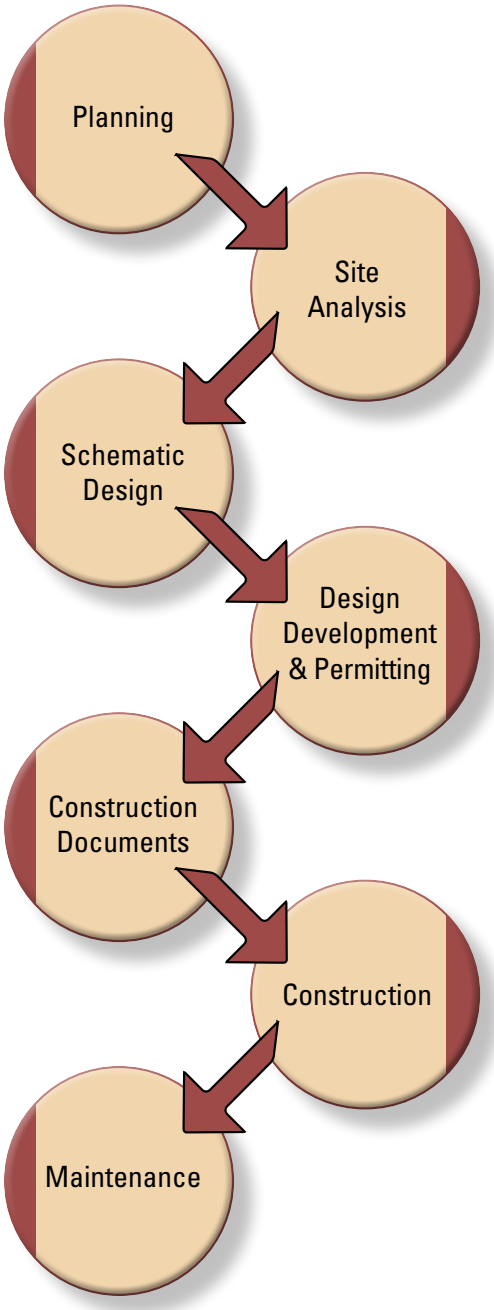
Design and Engineering

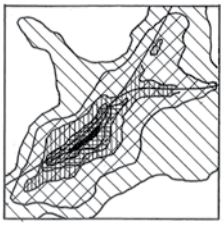
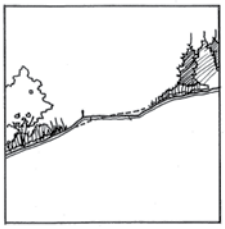
Design and Engineering
Overview

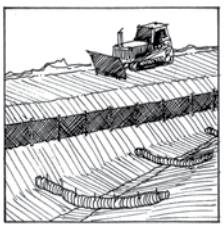
From Concept to Construction
This section recognizes that embedded in the technical aspects of a roadway project is the ability to directly support the mission of the Service. This section will guide you though a suite of considerations regarding the nuts and bolts of a roadway project, such as earthwork, alignment, safety, materials selections, vegetation preservation and management, construction practices and maintenance considerations.

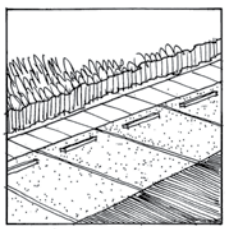
Designing a complete roadway project includes using methods and materials that minimize the environmental impacts of the roadway and associated construction work. It also involves developing a design that leads the roadway to function more often as a restorative system, helping to heal previously impacted or damaged natural environments. Working with an interdisciplinary team can greatly facilitate a holistic design and engineering process. Early coordination through the FWCA, and the ESA can provide valuable insight and expedite permit processes. A roadway design process can be approached methodically, beginning with a broad vision and narrowing down to the technical details and ultimately construction activities to make it happen. In the end, the project should be implemented in a manner consistent with FWS goals, applicable laws, and ideally, such that there is a benefit to the conservation of listed species and other FWS trust resources.

Process - Design to Construction



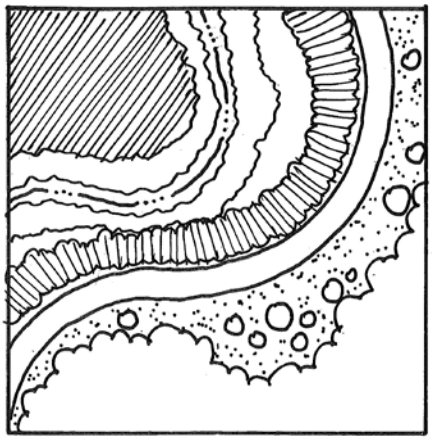


DE-1 Preserve and Restore Native Vegetation and Other Natural Resources

Intent

Roadway projects present opportunities to protect and restore native vegetation. Roadways commonly represent a barrier to wildlife and fragment habitat. However, roadway projects can represent an opportunity to heal historic wounds to a landscape and to ensure no further damage is done. Select roadway sites and alignments that avoid impacts to significant stands of existing vegetation. Look for restoration opportunities and consider what types of vegetation along roadway corridors are compatible with management goals.



Restored vegetation along road corridor can help support management goals.

Principles

- Explore ways to integrate restoration opportunities into project
- Consider how road surface conditions will affect nearby vegetation (e.g. dust, heat, other pollutants generated)
- Consider what types of vegetation and habitat along roadways will be compatible with management goals
- Use site prep and construction methods that protect and conserve existing native vegetation and natural resources
- Protect or stockpile and re-use healthy existing/native soils on site
- Protect heritage and other significant trees during and after construction (e.g. provide fencing, do not dig in or store material on top of root zones)
- Consider irrigation needs for establishing roadway vegetation
- Consider how invasive species will be managed during native vegetation establishment periods

Metrics

- Amount of post-construction restoration planned
- Vegetation surveys
- Reduced invasive species control needs

Resources

Regional guidelines for roadside development.

ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Comprehensive guidebook on roadside revegetation.

FHWA. 2007. Roadside Revegetation: An Integrated Approach to Establishing Native Plants.

New technology to minimize pile-driving construction impacts to aquatic organisms.

Reyff, James. 2009. Reducing Underwater Sounds with Air Bubble Curtains.

Road alignment at Nestucca Bay NWR preserves upland vegetation and forest.

Alex Schwartz/USFWS

Brian Bainnson

This roadway project at Steigerwald NWR required integration of native vegetation restoration (right). The planting plan was prepared by a registered landscape architect. The plants were installed by a licensed landscape contractor. Work included a temporary irrigation system and a 1-year maintenance and warranty period.

DE-2 Consider and Plan for Invasive Species Management

Intent

Invasive species are a major issue for habitat restoration and wildlife management efforts. Roadways often serve as a significant vector for the spread of invasive species. Thus, particular attention must be paid to this issue in the planning, design and maintenance of road corridors and road networks.

Principles

- Inventory invasive species in the region that are already present and what steps have been taken to combat their spread
- Ensure that planting plans feature plant species and densities, as well as establishment techniques to limit future invasive establishment
- Consider latest tools and techniques available to combat spread of invasive species
- Examine relevant state and regional lists of invasive species threats
- Search for and consider lessons from other relevant projects, based on similar ecosystems and/or similar project types
- Develop pre-project baselines to measure success of future management goals
- Address and plan for invasive species management during construction and general use
- Create an invasive species management plan following local Best Management Practices (BMPs), addressing both roadside and adjoining habitats
- Minimize disturbance and project footprint, including mobilization and staging areas

Metrics

- Invasive species survey data
- Staff time dedicated to invasive species management (and how that changes over time)

Resources

Invasive species along roadways from the perspective of road and landscape ecology (see Chapter 4, pp. 75-111).

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions.

Establishment and maintenance of native plants along roadways.

Harper-Lore, Bonnie and Maggie Wilson, editors. 2000. Roadside Use of Native Plants. Available online at: http://www.fhwa.dot.gov/environment/rdsduse/index.htm.

FHWA. 2007. Roadside Revegetation: An Integrated Approach to Establishing Native Plants.

Guidance on roadside weed management.

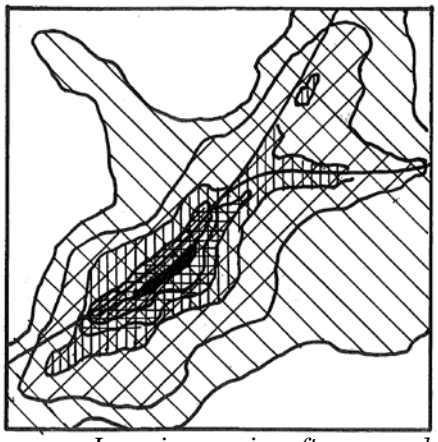
Ferguson, Leslie, C. L. Duncan and K. Snodgrass. 2003. Backcountry Road Maintenance and Weed Management.

Comprehensive list of roadside vegetation management resources.

Center for Environmental Excellence by AASHTO - Invasive Species/Vegetation Management, Reseach, Documents & Reports web page. See: http://environment.transportation.org/environmental_issues/invasive_species/docs_reports.aspx.

List of many resources on controlling invasive species, from construction best practices to ongoing maintenance.

Wisconsin Department of Transportation (WisDOT). 2003. Best Practices for Control of Invasive Plant Species.



Invasive species often spread outward from roadways.

Selected Steps for Invasive Species Management

- Post-construction maintenance plan
- Minimize disturbance
- Retain shade to the extent possible
- Know the quality of topsoil and mulch; avoid importing contaminated topsoils
- Know the quality of seed sources
- Clean equipment that has had contact with weed sources
- Over-sow disturbed areas with native seeds
- Avoid nitrogen fertilizers in the first year

List adapted from FHWA Roadside Revegetation Manual. See section 5.8 in manual.

Ryan Hagerty/USFWS

Controlling invasive species after their spread can be labor-intensive; spraying melaluka in FL (right).

DE-3 Minimize Cut and Fill to Fit With Existing Landscape

Intent

Roadways can be designed to fit with natural topography and seamlessly integrate with the landscape character. By studying the natural topography, designers can attempt to select a road alignment that will take advantage of views, while also minimizing the visual impact of the road itself. Conforming to the natural topography can minimize interruptions to the natural hydrology, and may help to preserve other important natural features, vegetation and habitat.

Elevated structures are often preferable for wildlife and habitat connectivity, and should be considered where possible. If that results in a cut/fill imbalance then seek innovative ways to use fill material. Examples include using excess fill material to construct pullouts, scenic viewpoints, and trailheads. Earthwork considerations discussed in this guideline are appropriate for both new construction projects and alterations or improvements to existing roadways.

Principles

- Consider roadway alignments that will minimize and balance cut and fill volumes
- Consider alternative structures to reduce fill volumes (e.g. bridge vs. culvert, etc.)
- Use roadways to highlight Refuge habitats as they follow existing terrain
- Look for continued opportunities to minimize and improve "aesthetic wounds"

Metrics

- Earthwork volumes per mile (compare to similar projects)
- Balanced cut and fill volumes
- Visual resources assessment

Resources

See cut and fill guideline on page 83.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Case study on context sensitive solutions (CSS) for scenic highway.

Kentucky Transportation Center. Undated. Context-Sensitive Design Case Study No. 1: Paris Pike - Kentucky. College of Engineering, University of Kentucky. Lexington, KY.

Guidelines on appropriate lower-impact road alignment.

Jones, Grant R., et al. 2007. Applying Visual Resource Assessment for Highway Planning (pp.130-139) and Road Alignment (pp.330-341). In Landscape Architecture Graphic Standards. Hoboken, New Jersey: John Wiley & Sons. Available at: http://www.jonesandjones.com/news/publications.html.

Road design guidelines.

FHWA. Undated. Flexibility in Highway Design. FHWA Pub. No. FHWA-PD-97-062. Found at: http://www.fhwa.dot.gov/environment/flex/index.htm.

Common standard on roadway design.

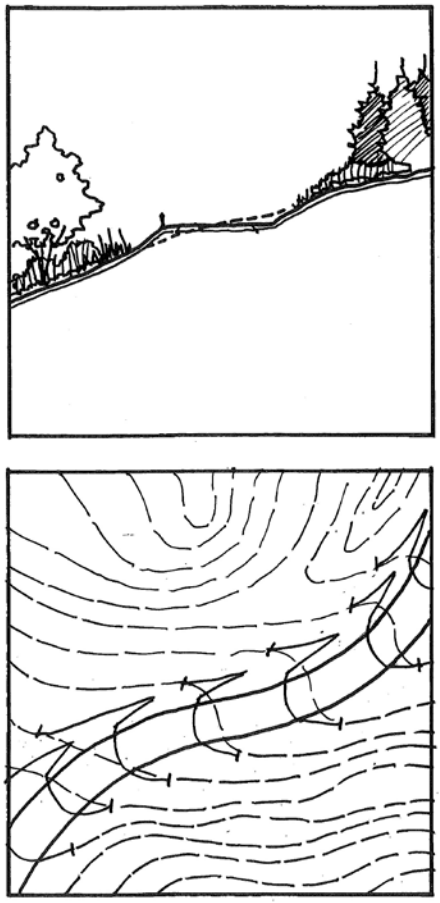
AASHTO. 2004. AASHTO A Policy on Geometric Design of Highways and Streets, 5th Edition (aka 'Green Book). Washington, D.C.

Guidelines for design of very low volume roadways.

AASHTO. 2001. Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), 1st Edition. Washington, D.C.

Gravel roads maintenance and design.

Skorseth and Selim. 2000. Gravel Roads Maintenance and Design Manual. South Dakota Local Transportation Assistance Program (USDOT - FHWA).



Fitting in with existing topography is key to minimizing impacts.

Roadway terraced along hillside at Hart Mountain NWR responds to opportunities and constraints of the topography

Fort Photo/Flickr.com

DE-4 Consider Road Geometries for Lower Speeds, Safety and Alertness

Intent

Low speeds can help protect wildlife, increase the value of roadside habitat and provide a greater degree of safety for all roadway users. In addition to improved safety for wildlife and roadway users, low travel speeds are compatible with the Big Six public uses. Low road speeds help to encourage alternative modes of transportation, including walking and bicycling. Lower actual speeds are achieved through deliberate roadway geometry and design, not simply signage.

Curving roads with varying views can promote alertness and lower speeds.

Principles

- Road alignments may include continuous curves, spiral curves, curving alignment, etc. in order to support safety and alertness
- Consider how curvilinear road geometries achieve multiple objectives and can specifically support habitat and wildlife management goals
- Consider the effect of road surface on travel speeds
- Determine and design around a roadway 'design speed' so that people will *want* to drive slower
- Consider safety and engineering standards that are applicable to the roadway's context

Metrics

- Road speed and volume study
- Accident reports
- Visual resources assessment
- Balanced cut and fill volumes
- Protection of vegetation and habitat
- FHWA Road Safety Audit

Resources

Design guidance based on human behavior patterns.

Transportation Research Board of The National Academies. 2008. Human Factors Guidelines for Road Systems.

Guidelines on appropriate lower-impact road alignment.

Jones, Grant R., et al. 2007. Applying Visual Resource Assessment for Highway Planning (pp.130-139) and Road Alignment (pp.330-341). In Landscape Architecture Graphic Standards. Hoboken, New Jersey: John Wiley & Sons. Available at: http://www.jonesandjones.com/news/publications.html.

Road design guidelines.

FHWA. Undated. Flexibility in Highway Design. Access at: http://www.fhwa.dot.gov/environment/flex/index.htm.

Standards for roadway design.

AASHTO. 2004. AASHTO A Policy on Geometric Design of Highways and Streets, 5th Edition (aka 'Green Book).

Handbook with design guidance on appropriate construction techniques for low traffic volume roads.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Curving roadway at Nestucca Bay NWR highlights scenery and discourages high speeds (top); emergency personnel respond to an accident at Ridgefield NWR (bottom).

Alex Schwartz/USFWS

USFWS

DE-5 Consider Construction Impacts and Best Practices

Intent

Roadway construction can have major impacts to terrestrial and aquatic organisms, as well as to environmental quality. Appropriate project planning, project management and construction management should be applied to ensure that impacts from construction activities are minimized and acceptable. The overall project footprint should be minimized as much as possible, especially with regard to construction activities such as staging materials and equipment.

Principles

- Consider appropriate season for construction
- Minimize construction impacts to terrestrial and aquatic organisms
- Implement construction best practices, such as dust and erosion control
- Look for staging opportunities that use existing developed sites and minimize impact to adjacent habitat areas
- Consider impacts of construction needs, such as water, on the surrounding environment
- Consider how construction elements, such as water wells, could be used for staff and visitor services in the future

Metrics

- Changes in population counts or behavior (e.g. breeding) of local organisms
- Visible signs of disturbance beyond limits of work
- Compliance with erosion control plan elements

Resources

Handbook with design guidance on appropriate construction techniques for low traffic volume roads.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Good checklist for items to address or consider.

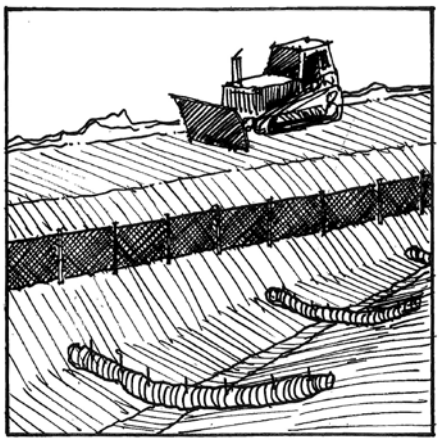
ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Guidelines with resources on environmentally-friendly construction practices.

University of Washington and CH2MHill. 2009. Greenroads Rating System, v1.0. http://www.greenroads.us/.

New technology to minimize pile-driving construction impacts to aquatic organisms.

Reyff, James. 2009. Reducing Underwater Sounds with Air Bubble Curtains.



Standard practices such as using silt fencing help reduce construction impacts to adjacent habitat.

Construction on an entry road, parking lot, and trailhead project at Steigerwald NWR, in partnership with FHWA's Federal Lands Highways program. Project required extensive multidisciplinary planning, design, and construction expertise to ensure implementation of best construction practices and minimization of habitat and scenic area disturbance.

FHWA

BMPs: Best Management Practices

Best management practices are methods that have been determined to be the most effective and practical means of preventing or reducing a project's short- and long-term environmental impacts. BMPs focus on prescriptive measures, typically in the construction and maintenance phases of a project. Design Guidelines are more general and require interpretation and adaptation.

BMPs available for roadway construction projects include:

- Erosion control
- Equipment and operation
- Noise and emissions
- Spill and Pollution Prevention
- Safety

DE-6 Consider Range and Sources of Materials for Sustainable Construction

Intent

There are numerous options available for materials that have sustainable characteristics. Consider selecting materials with lower embodied energy and carbon footprints, recycled content, high durability, and which have a high level of environmental performance. Using sustainable materials can achieve compliance with the Service's environmental and performance goals, as well as save money in the long term. Even existing roadway materials can be effectively recycled into a new project, including asphalt, aggregates and fill material.

Principles

- Identify range of materials that would be suitable or possible to use in a given project
- Consider various qualities of material options, including environmental performance, longevity, maintenance needs and aesthetic fit
- Study past performance and success of materials in other sites (case studies)
- Consider using materials that are certified for sustainability
- Consider paying more for a more durable material that may save money (through performance and maintenance) in the long run
- Source materials locally where possible

Metrics

- Embodied energy calculations
- Runoff discharge rates

Resources

See materials listed in Greenroads Guidelines.

University of Washington and CH2MHill. 2009. Greenroads Rating System, v1.0. http://www.greenroads.us/.

Check on embodied energy of proposed materials at University of Bath's Inventory of Carbon & Energy (ICE) Wiki.

See: http://wiki.bath.ac.uk/display/ICE/Home+Page.

The Sustainable Sites Initiative (SSI) provides resources and guidelines for materials and site development.

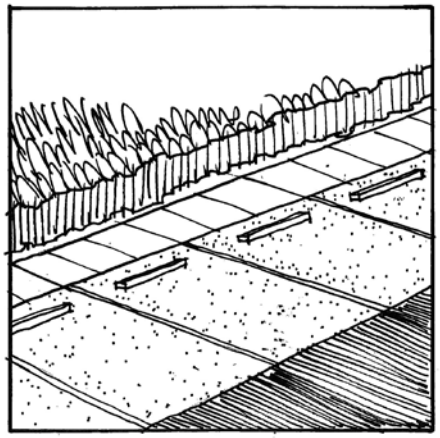
See: http://www.sustainablesites.org/.

For sites that include buildings, calculate the project's carbon footprint at BuildCarbonNeutral.

See: http://buildcarbonneutral.org.

Information and data on sustainable materials.

Calkins, Meg. 2009. Materials for Sustainable Sites.



Materials may vary for travel lanes, parking stalls and pedestrian pathways.

A parking lot at Tualatin River NWR used warm mix asphalt for main travel ways, pervious pavers in parking stalls and features a bioswale with amended soils and native plants to cleanse stormwater in order to protect habitat (top); local and sustainable materials were used to construct an Auto Tour pullout / wildlife viewing area at Modoc NWR (bottom).

Brain Baimson

Steve Clay/USFWS

Embodied Energy and Carbon Footprints

Embodied energy is generally defined as the energy (commercial and industrial) that was used to make a product. It generally includes the energy used to deliver the product to its point of use or consumption, and may also include any energy needed for the deconstruction and disposal of the product. It is commonly measured in megajoules of energy per kilogram of product (MJ/kg).

A carbon footprint is a similar metric, which measures the total amount of greenhouse gas emissions caused by a product. It is often expressed in terms of tons of CO_2 produced per kilogram of product (tCO_2/kg).

DE-7 Consider Maintenance

Intent

When planning a new roadway or retrofits to existing facilities, it is important to anticipate both short- and long-term maintenance needs. During the design phase, consider whether anticipated maintenance of potential designs is realistic, given existing or likely future budgets, staff training and skills, and other related factors. To be successful in their purpose, new types of materials (e.g. pervious paving) or facilities (e.g. wildlife underpasses or signals) may have new maintenance needs requiring staff training. Consider also that regular maintenance practices can extend the life of a facility. Weigh the pros and cons of potentially higher first costs with the benefit of lower life cycle maintenance costs for durable projects.

Consider trade-offs between longevity and maintenance needs.

Principles

- Examine current maintenance budgets, responsibilities and staff availability in concert with partners
- Estimate increase or reduction of maintenance needs for new facilities
- Consider current skills of maintenance staff and what types of training may be needed
- Consider whether contractors would be required to complete maintenance activities
- Be aware of concerns about adopting new practices, and be prepared to understand and address the concerns of operations and maintenance staff
- Provide achievable and responsive BMPs
- Discuss early in project who is responsible for repairs and maintenance to wildlife-specific facilities such as fencing
- Consider maintenance partnerships with State and County Transportation Dept's to leverage their transportation resources and expertise
- Consider the impacts of chemicals or other products that are used in roadway maintenance

Metrics

- Historic vs. current maintenance costs
- Road closure data
- BMPs correctly applied in field

Resources

Handbook with design guidance on construction and maintenance techniques for low traffic volume roads.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Good checklist for items to address or consider.

ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Gravel roads maintenance & design.

Skorseth and Selim. 2000. Gravel Roads Maintenance and Design Manual. South Dakota Local Transportation Assistance Program (USDOT - FHWA).

BMPs for rural road maintenance.

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Roadside vegetation management.

WSDOT. 1997. Integrated Vegetation Management for Roadsides.

Maintenance guidelines for sensitive areas.

Crane, Bill. 2006. Road Maintenance with Threatened, Endangered, or Sensitive Plants: Finding Solutions.

Maintenance guidelines.

Ruiz, Leo. 2005. Guidelines for Road Maintenance Levels.

Fire being used for maintenance of roadside vegetation

USFWS

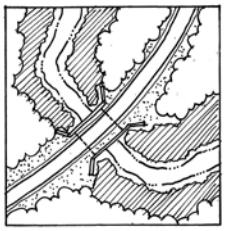
Organism Passage

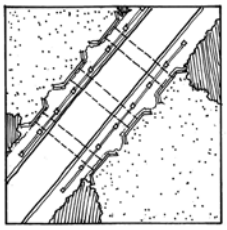
Organism Passage
Overview

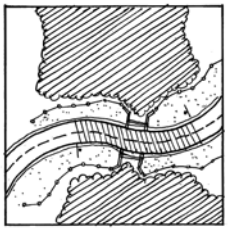
Terrestrial and Aquatic Passage
The conservation of fish, wildlife, plants and their habitats is the primary FWS mission. Roadways have major impacts on terrestrial and aquatic organisms. Roadways create barriers to wildlife movement and fragment habitat. Ensuring that organisms are able to safely move across (either over or under) roadways to meet basic life requisites is imperative to meeting the Service's mission.

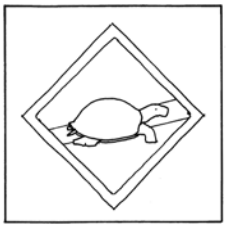
This section is intended to help direct you to guidance and resources for improving terrestrial and aquatic organism passage. The guidelines in this section reflect the growing body of science that documents the need for wildlife-sensitive planning, design, engineering, and construction of roadways. Recognizing the highly site- and species-specific nature of aquatic and terrestrial passage issues, you are particularly encouraged to seek out resources on regionally-appropriate techniques to facilitate passage of terrestrial and aquatic organisms. In areas where ESA listed species or critical habitat may benefit from a passage improvement, additional conservation measures may be warranted during both the design and construction phases.

Addressing organism passage issues on FWS managed lands is an emerging priority for the Service which these guidelines are intended to support. At present, addressing organism passage issues on FWS lands is most realistic in conjunction with high priority infrastructure projects such as bridge replacements. A future possibility is that projects intended to specifically address organism passage will be eligible for Refuge Roads funding.









OP-1 Develop Your Corridor Plan for Crossing

Intent

It is important to develop a comprehensive plan to address aquatic and terrestrial connectivity along a roadway. Corridor level plans are necessary to document habitat fragmentation, lack of stream continuity, population level roadway avoidance effects and wildlife-vehicle collisions (WVC). In addition to identifying the ecological impacts a roadway is having on organisms, plans should identify funding opportunities and partnerships in support of recommended mitigation measures. Successful plans identify target species and crossing "hot spots". Prioritize your specific individual crossing projects and include conceptual design documentation for crossing structures and supporting mitigation measures.

Principles

- Develop organizational partnerships
- Solicit expert review and input; wildlife crossing structures require expert design and review
- Monitor to locate roadkill hotspots but consider how roads change animal movements (avoidance)
- Identify target species based on management objectives
- Consider how crossing needs align with other transportation priorities and budgets
- Consider species' home range size and seasonal movements to determine extent of passage needed
- Consider how current or future roadway design speed and traffic volumes may impact wildlife

Metrics

- Safety (animal/vehicle collision reductions)
- Species population health
- Dispersal capability
- Daily/seasonal movement necessary to meet life requisites

Resources

Latest information on road ecology as it relates to mitigating interactions between roads and wildlife.

Beckmann, J. P., A. P. Clevenger, M. P. Huijser, and J. A. Hilty. 2010. Safe Passages.

Coordinating aquatic and terrestrial passage opportunities.

Jacobson et al. 2007. Combining Aquatic and Terrestrial Passage Design into a Continuous Discipline.

Effectiveness of various wildlife crossing facilities.

Transportation Research Board of The National Academies. 2008. Evaluation and the Use and Effectiveness of Wildlife Crossings (NCHRP Report 615).

Best practices for reduction of WVC.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Best Practices Manual. Access at http://www.fhwa.dot.gov/environment/hconnect/wvc/index.htm.

Guidance on reduction of WVC.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Report to Congress. Access at http://www.fhwa.dot.gov/publications/research/safety/08034/index.cfm.

Effects of roadways on wildlife (see entire Conservation Biology issue).

Trombulak, Stephen and C. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities.

Background research on roadway impacts to wildlife.

Mader, Sharon. 2006. Comparing the Ecological Effects of Linear Developments on Terrestrial Mammals.

See list of crossing issues by state, by FWS national Refuge Roads Coordinator (unpublished).

Wildlife Crossing and Aquatic Organism Passage Issues by State.

Examine the roadway corridor for locations where organisms would prefer to cross in the absence of a roadway. Study topography, vegetation patterns and hydrology along the corridor.

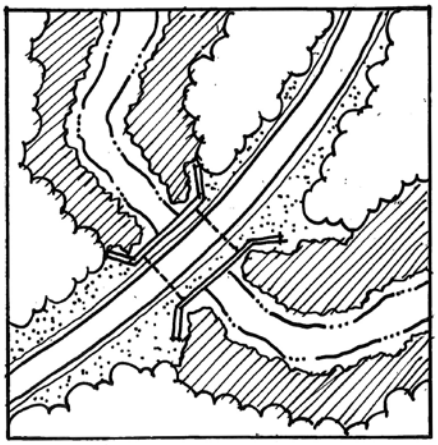
A corridor management and wildlife crossing plan is a critical tool to plan and fund projects; map showing monitoring locations for crossing plan study (below).

Robert Henke et al.

OP-2 Provide and Enhance Aquatic Organism Crossings

Intent

Roads, streams and rivers are similar systems in that they all transport material and organisms across the landscape in a linear fashion. Stream and river functions, such as the movement of woody debris, sediment transport and fish and wildlife passage have historically been impeded by engineering solutions intended to minimize disruptions to roadway infrastructure. Recognizing the importance of aquatic resources on FWS managed lands, an ecosystem-based approach to aquatic organism passage focuses on maintaining the continuity of a stream or river's characteristics where that system intersects a roadway.



Locate aquatic crossings to minimize interruption to normal stream flow and channel migration.

Principles

- Consider and design for long-range traffic volume projections for road
- Consider seasonality of wildlife movement and stream flows
- Develop list of target species for aquatic organism passage and focus planning and design efforts on supporting overall ecosystem health
- Consider range of stream crossing solutions and techniques
- Culverts or bridges that mimic the slope, structure and dimensions of the natural stream bed can allow aquatic species to freely move under roadways
- Plan for appropriate post-construction riparian and streambed restoration work
- Consider maintenance needs for various stream crossing designs
- Plan for appropriate in-water work windows
- Consider how to best complete road maintenance activities at or near stream crossings in order to avoid impacts to water quality

Metrics

- Surveys to show healthy passage of aquatic organisms
- Water quality measurements (upstream vs. downstream)
- Re-colonization of upstream habitat by aquatic organisms (in cases of improving/upgrading existing crossings)

Resources

Analysis & costs of culvert design and aquatic organism passage.

MN Dept. of Transportation. 2009. Cost Analysis of Alternative Culvert Installation Practices in Minnesota.

Design guidelines and best practices for aquatic organism passage.

USDA Forest Service. 2008. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings.

Bridge construction guidance.

AZ Game and Fish Dept., Habitat Branch. 2008. Guidelines for Bridge Construction or Maintenance to Accommodate Fish & Wildlife Movement and Passage.

Riparian restoration guidance.

USDA Forest Service. 2002. Management Techniques for Riparian Restorations (Roads Field Guide, Volume II).

Design guidelines for stream crossings and proper road drainage.

William Weaver and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

See list of crossing issues by state, by FWS national Refuge Roads Coordinator (unpublished).

Wildlife Crossing and Aquatic Organism Passage Issues by State.

See aquatic organism passage in:

Proceedings of International Conference on Ecology and Transportation (ICOET). Access online at: http://www.icoet.net/.

Site visit to a new aquatic crossing structure during a Refuge Roads coordination meeting at Kenai NWR (top); viability for many aquatic species, such as salmon, depend on their ability to move through river and stream ecosystems (bottom).

John Sauer/USFWS

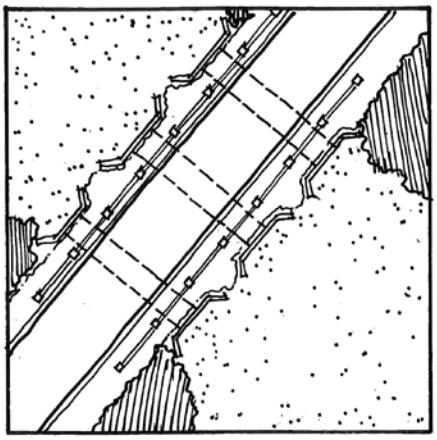
Florian Schulz

OP-3 Provide and Enhance Terrestrial Wildlife Crossings

Intent

Roadways are a significant barrier and danger for terrestrial organisms. When terrestrial organisms attempt to cross roadways in order to meet life requisites, fatalities and injuries can result for both wildlife and humans. If wildlife-vehicle collisions (WVC) regularly take place along a roadway, this is a good indicator of the need for mitigation. Another less visible effect of habitat fragmentation caused by roadways is avoidance behaviors that can have significant effects on populations.

The most effective mitigation measure to reduce WVC and to enhance terrestrial organism passage across roadways is to design and construct suitable crossing structures, in combination with barrier and diversion fencing, where appropriate. It is important to remember that every species is impacted by roadways in different ways. Terrestrial crossing projects can seek to meet multiple ecosystem connectivity objectives simultaneously.



Terrestrial wildlife crossings provide safer crossings for wildlife and connect fragmented habitat patches.

Principles

- Identify design species and their crossing structure needs; design crossings that work for as many species as possible
- Consider and design for long-range traffic volume projections for roadway
- Consider visual quality and aesthetic impact of structures
- Improve nearby habitat for wildlife, especially areas leading to or connecting with crossings
- Maximize opportunity for restoration project links to crossing/connectivity sites
- Consider "right crossing, right place" when locating crossings
- Review the corridor management or crossing plan
- Bridge replacements are the best opportunity in a 50-70 year time frame to create movement opportunities and should be taken advantage of even if no other projects are in the area

Metrics

- Evidence of unmet need to cross
- Improved wildlife counts in adjacent areas after crossing implementation
- Improved wildlife dispersal rates
- Reduction in WVC

Resources

Bridge construction guidance.

AZ Game and Fish Dept., Habitat Branch. 2008. Guidelines for Bridge Construction or Maintenance to Accommodate Fish & Wildlife Movement and Passage.

Wildlife crossing structures and fencing effectiveness evaluation.

Hardy et al, Western Transportation Institute. 2007. Evaluation of Wildlife Crossing Structures and Fencing US Hwy 93 Evaro to Polson.

Effectiveness of various wildlife crossing types.

Transportation Research Board of The National Academies. 2008. Evaluation and the Use and Effectiveness of Wildlife Crossings.

Best practices for WVC reduction.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Best Practices Manual.

Guidance on reduction of WVC.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Report to Congress.

See FWS Refuge Roads Coordinator list of crossing issues by state (unpublished).

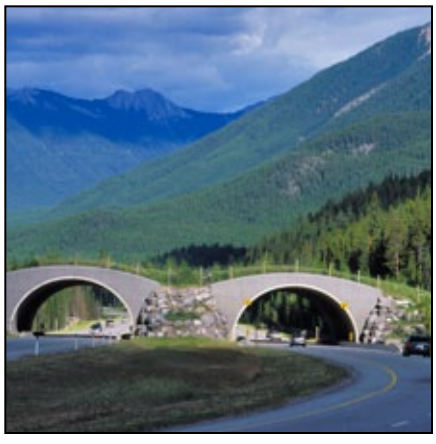
Wildlife Crossing and Aquatic Organism Passage Issues by State.

See crossing structure design in:

Proceedings of International Conference on Ecology and Transportation (ICOET). Access online at: http://www.icoet.net/.

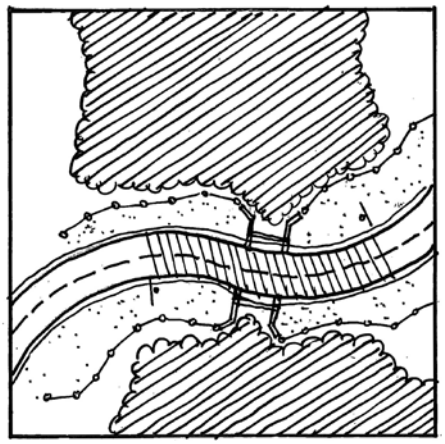
Bridge replacements are excellent opportunities to enhance terrestrial crossing opportunities (top); a wildlife overcrossing in Banff NP, Canada has successfully improved both safety and wildlife movement (bottom).

Brian Baimson



Florian Schulz

OP-4 Evaluate Need for Wildlife Fencing and Other Guiding Features



Fencing can help guide wildlife to safer crossing areas.

Intent

Wildlife-vehicle collisions (WVC) can be reduced through the use of barrier and diversion fencing or other features that help guide wildlife to crossing structures, including overpasses or underpasses. Effective wildlife barrier and diversion fencing forces animals off the road and into a crossing structure. In order for a crossing structure to be effective, it needs to be designed in conjunction with fencing. Project teams should consider aesthetics, where to end fencing and how fencing relates to topographical features in the landscape. Fencing design is highly species-specific and should be designed in consultation with an expert.

Barrier and diversion fencing requires maintenance. Successful projects account for maintenance concerns and budgets during the design phase. Fencing discussions might include a consideration of how to handle fence ends. Where to end a fence has major safety implications. It is a difficult decision, and is best done in consultation with an expert.

Principles

- Study WVC or other interactions along the corridor
- Recognize that fencing is a last resort option, and that the outcomes can be deadly for wildlife inadvertently trapped on a roadway
- Design fencing treatments based on species and environmental conditions
- Include escape structures in the design; jumpouts are more effective than the commonly used one-way gates
- To avoid "end run" WVC, end fencing beyond prime habitat areas *or* at locations with good visibility
- Boulder piles can act as a maintenance-free fence for ungulates
- Consider how best to accommodate multiple species
- Consider the aesthetic impacts of wildlife fencing
- Consider how to handle fencing at access roads

Metrics

- WVC counts
- Reduction in wildlife mortality due to WVC

Resources

BMPs for reduction of WVC.

FHWA. 2008. Best Practices Manual, Wildlife Vehicle Collision Reduction Study (Report to Congress). Found at http://www.fhwa.dot.gov/environment/hconnect/wvc/index.htm.

Wildlife crossing structures and fencing effectiveness evaluation.

Hardy et al, Western Transportation Institute. 2007. Evaluation of Wildlife Crossing Structures and Fencing on US Hwy 93 Evaro to Polson.

Effectiveness of various wildlife crossing types.

Transportation Research Board of The National Academies. 2008. Evaluation and the Use and Effectiveness of Wildlife Crossings (NCHRP Report 615).

Website with additional guidelines and case studies of construction and maintenance practices to benefit wildlife along roadways.

FHWA - Keeping It Simple: Easy Ways to Help Wildlife Along Roads. See: http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm.

Continuous page wire fencing is commonly used to keep wildlife off roads and to direct them to crossing structures (top); jumpouts are essential features to allow trapped animals to leave the road whenever continuous fencing is used (bottom).

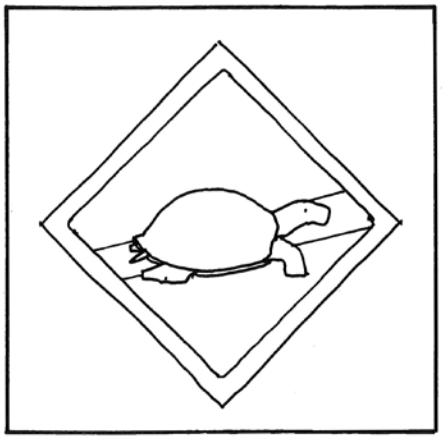
lisahends/Flickr.com

USFWS

OP-5 Consider Warning and Safety Systems for Drivers

Intent

An important component of facilitating terrestrial organism passage is promoting adequate awareness and caution on the part of drivers. Various systems exist to warn drivers of the presence of wildlife on a roadway. These systems include static signs to alert drivers to zones where wildlife typically cross roadways as well as flashing lights or other signals that respond to the presence of wildlife near the roadway. The most effective signage systems are active warning systems. Static warning signs, if strategically placed and well designed, can improve public awareness and may be a good fit for low volume roads.



Warning signs can help remind drivers to look out for wildlife on the road.

Principles

- Select the appropriate type of signage for the species, roadway LOS and site conditions
- Provide public information on the crossing design and intent
- Consider active warning systems for "end runs" of fencing, crossing hot spots and as temporary mitigation measures in the absence of crossing structures
- Consider the related benefits of communicating crossing and habitat areas, such as public education and communicating stewardship

Metrics

- Wildlife-vehicle collision (WVC) statistics (note that these are a better measure of safety than ecological conditions; even then, they are suspect unless expertly interpreted)

Resources

BMPs for reduction of WVC.

FHWA. 2008. Best Practices Manual, Wildlife Vehicle Collision Reduction Study (Report to Congress). Found at http://www.fhwa.dot.gov/environment/hconnect/wvc/index.htm.

Wildlife crossing structures and fencing effectiveness evaluation.

Hardy et al, Western Transportation Institute. 2007. Evaluation of Wildlife Crossing Structures and Fencing on US Hwy 93 Evaro to Polson.

Research on effectiveness of methods for collision reduction.

Huijser et al, and Salsman and Wilson. 2006. Animal Vehicle Crash Mitigation Using Advanced Technology, Phase I: Review, Design And Implementation, SPR-3(076).

In areas where wildlife is known to cross roadways, active warning systems can be effective to alert drivers to the presence of wildlife on or near a roadway.

Florian Schulz

Stormwater Management

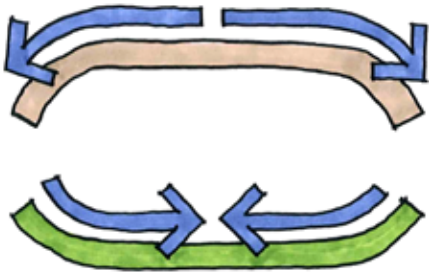
Stormwater Management
Overview

Cleaning Water, Improving Habitat
It is important to consider what happens to stormwater runoff along the entire roadway. Runoff from roadways on FWS managed lands may deliver chemical pollutants and sediment to surface and ground water. Roadways have a profound effect on the hydrology of a given site and watershed. Impervious surfaces increase runoff rates, volumes, temperature and duration. Roadway surfaces can concentrate flows, creating unnatural flow regimes that impact adjacent lands and lead to cumulative impacts downstream at the watershed scale, such as erosion and flooding.

This section discusses sustainable stormwater management techniques and points you to educational resources and guidelines on their design, construction and maintenance. Such techniques can help to clean stormwater runoff from roadways, filtering out particulates and other pollutants. They can also slow flows and detain water during peak storm events, restoring more natural flows to adjacent water bodies. A common term used to describe this approach to stormwater management is low impact development (LID). LID emphasizes conservation and the use of existing natural site features, integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns.

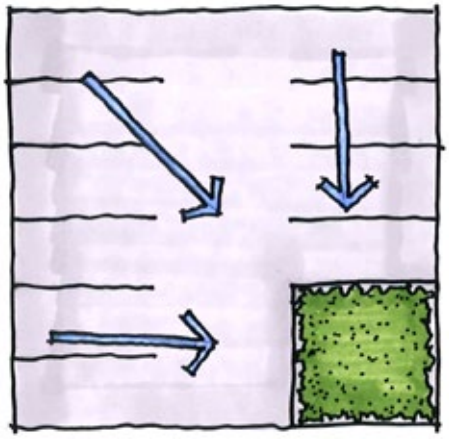
LID techniques include various features known collectively as natural drainage systems (NDS). These rely mainly on plantings, amended soils and other natural materials to treat, detain and retain stormwater runoff; these are often referred to as bioretention. Bioretention features include bioswales and rain gardens. Areas dedicated to NDS serve to buffer high value habitat from ecological disturbances caused by roadway infrastructure. Natural drainage features may also provide screening or visual buffering—functions that are often desirable when separating uses on a site or landscape.

NDS should be designed and implemented with care, so as to be compatible with habitat management goals. Concerns about their use include drawing wildlife closer to roadways through habitat creation (potentially causing increased negative animal-vehicle interactions), and the possibility of concentrating roadway pollutants into specific areas at levels that may be harmful to wildlife. These are important concerns to address, and care should be taken that each facility is designed to meet site-specific concerns.

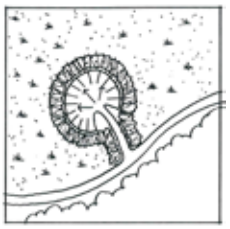


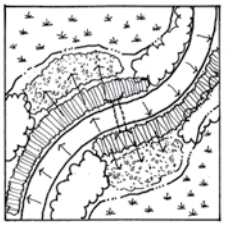
Typical facilities disperse runoff without treatment (top), while an LID approach detains and cleans water on site (bottom)

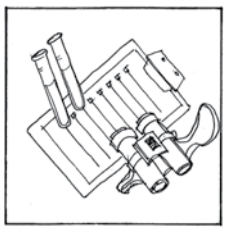
LID Philosophy
LID asks us to nurture stormwater rather than dispose of it. NDS features van help to achieve this.

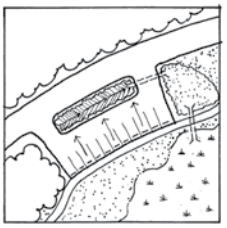


Typical NDS Sizing
An NDS feature such as a bioretention area typically requires an area of only 10% of the impervious area it is designed to treat.









SM-1 Buffer Habitat from Polluted Runoff

Intent

Runoff from roadways can carry unwanted pollutants into adjacent streams and water bodies. It can also adversely affect (increase) the temperature of receiving water bodies. Methods for reducing pollution (chemical, particulate and temperature) should be considered and used to minimize or eliminate water quality issues roadway runoff. Treatment facilities in the right-of-way can also serve to intercept and improve the quality of runoff water from other nearby sources.

Principles

- Adhere to a low impact development (LID) strategy in planning and designing repairs and improvements
- Consider natural drainage system (NDS) treatment facilities, including filter strips and bioswales
- Stormwater treatment facilities and approach need to be site-specific
- Consider appropriate NDS features for the type of roadway—parking, auto tour route, entry/access road, highway, etc.
- Look at hydrology planning in the area and be aware of roadway impacts on it

Metrics

- Water quality testing
- Temperature monitoring

Resources

Design guidelines for LID features.

US Dept. of Defense. 2004. Unified Facilities Criteria (UFC) - Design: Low Impact Development.

LID guidelines for Pacific NW.

Hinman, Curtis. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. Puget Sound Action Team. Access at: http://www.psparchives.com/publications/our_work/stormwater/lid/lid_tech_manual05/LID_manual2005.pdf.

Buffer design guidelines for that include stormwater treatment.

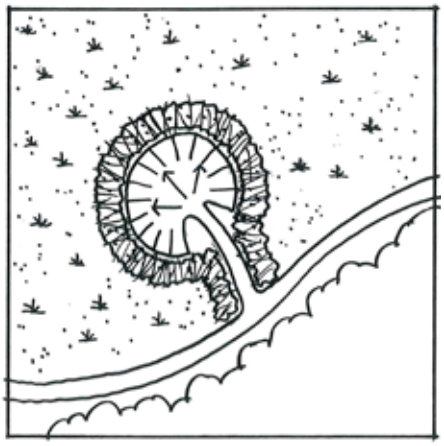
Bentrup, G. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Access at: http://www.unl.edu/nac/bufferguidelines/.

Roadway design guidance for lower impact to hydrology.

Dashiell and Lancaster. Undated. Road Design Guidelines for Low Impact to Hydrology. Five Counties Salmonid Conservation Program.

White paper on integrated LID and ecological analysis.

Mensing and Chapman. Undated. Conservation Development and Ecological Stormwater Management: An Ecological Systems Approach.



NDS features receive, clean and detain or retain runoff from roadways and other impervious surfaces; they can buffer habitat areas from negative ecological impacts.

Parking lot runoff at McNary NWR drains to a central bioswale that treats polluted runoff and buffers habitat from roadway impacts.

Brian Bainsson

Water Quality 101 **Issue: Stormwater runoff from roads and parking lots is laden with pollutants**

Alex Schwartz/USFWS

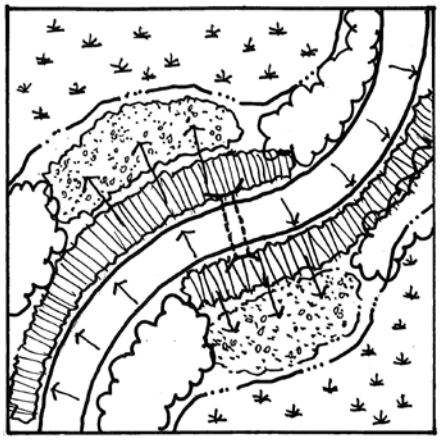
- Conventional facilities collect and drain polluted runoff using a variety of methods, such as sheet draining, "grassy swales," curbs and drainage inlets. These can quickly convey pollutants directly to sensitive habitats before the pollutants can be filtered out (*left*).
- Improved facilities are designed to intercept and filter polluted runoff before discharge to sensitive habitats (*right*).

SvR Design

SM-2 Protect Habitat from Erosive Flows and Flooding

Intent

The rate of flow of runoff from roadways is major issue of concern. Flow rates are typically much higher and shorter in duration than those which would come from the same areas in unpaved conditions. Such spikes in flow rates create erosion and flooding issues and prevent groundwater recharge. These effects can have major detrimental impacts on fish, wildlife and their habitats. Natural drainage system (NDS) facilities should be designed to not only clean water, but to detain peak flows and, where appropriate retain, runoff locally. Target flow control should be based on undeveloped conditions for local ecosystems, as well as current soil conditions and downstream concerns.



NDS features can detain runoff, slowing its flow to adjacent water bodies.

Principles

- Minimize quantity of stormwater runoff
- Minimize use of impervious materials
- Technologies to address water quantity issues include wet ponds, porous pavements, bioswales and rain gardens
- Improvements (stormwater facilities) must be sized appropriately to handle flow

Metrics

- Measurements of stormwater runoff rates and volumes
- Hydrographs for receiving water bodies

Resources

Design guidelines for low-use roads, focusing largely on hydrology.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Low impact development (LID) guidelines for Pacific Northwest.

Hinman, Curtis. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. Puget Sound Action Team. Olympia, WA.

Design guidelines for LID features.

US Dept. of Defense. 2004. Unified Facilities Criteria (UFC) - Design: Low Impact Development.

Info on vegetative filter strips (page 44) and other practices.

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Roadway design guidance for lower impact to hydrology.

Dashiell and Lancaster. Undated. Road Design Guidelines for Low Impact to Hydrology. Five Counties Salmonid Conservation Program.

BMPs for ESA compliance.

WSDOT. Best Management Practices Field Guide for ESA Sec 4(d) Habitat Protection.

A gravel parking lot with central vegetative swale at Ash Meadows NWR minimizes impervious materials and allows for large storm events to be infiltrated on site, away from more sensitive habitats.

Jeff Holm/USFWS

Water Quantity 101 **Issue: Impervious surfaces increase runoff rates, temperature, and volume**

SvR Design

- Runoff from impervious areas often concentrates flows, which impacts adjacent lands and also leads to cumulative downstream and watershed-scale impacts
- Where space is limited or linear alignment is tight, choose materials such as pervious paving (*left*) to reduce runoff rates
- Use NDS features to detain runoff before discharge (*right*)

SvR Design

SM-3 Monitor and Maintain Stormwater Facilities

Intent

Monitoring and maintaining stormwater facilities after project construction is key to learning from your work and improving the effectiveness of future projects. Particular attention should be given to monitoring the effects of the project on the landscape's environmental quality. Budgeting for and following standard monitoring and maintenance protocols are a critical component for stormwater management on FWS managed lands.

Principles

- Employ stormwater facility monitoring protocols (per ASCE or other standards)
- Maintain facilities in a manner that optimizes facility performance
- Collect relevant baseline data before project construction
- Check for and use appropriate control measures on any invasive species
- Check for levels of contaminants coming from roadway, and track their fate in areas adjacent to roadway
- Monitor level of compatibility with local wildlife and surrounding habitats
- Document maintenance needs and costs
- Document effectiveness of soil mixes and plants used
- Share or publish monitoring results to help improve design and results in other projects
- Use monitoring results in adaptive management

Metrics

- Measurements of stormwater runoff rates, volumes, temperature and contaminants
- Hydrographs for receiving water bodies
- Analysis documenting water quality improvements due to NDS features

Resources

Technical guidelines for monitoring of stormwater in various conditions.

US EPA. 2002. Urban Stormwater BMP Performance Monitoring. Access at: http://water.epa.gov/scitech/wastetech/guide/stormwater/monitor.cfm.

NDS maintenance guidelines that include guidance on monitoring.

City of Bellevue, WA. 2009. Natural Drainage Practices Maintenance Guidelines. Access at: http://www.bellevuewa.gov/pdf/Utilities/Natural_Drainage_Practices.pdf.

Study from UC Davis & USFS finding that bioswale significantly reduced runoff and removed pollutants; includes monitoring protocols used.

Xiao, Qingfu and E. G. McPherson. 2009. Testing a Bioswale to Treat and Reduce Parking Lot Runoff. Access at: http://www.fs.fed.us/psw/programs/cufr/products/psw_cufr761_P47ReportLRes_AC.pdf.

Standard operating procedures for stormwater monitoring.

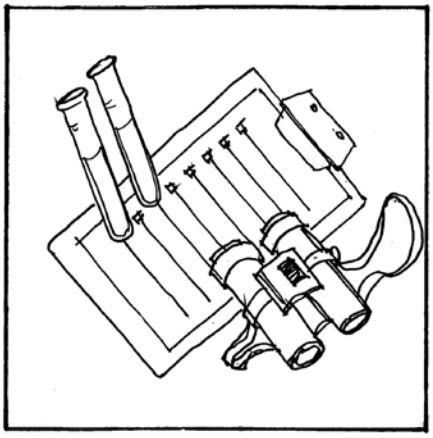
Washington Department of Ecology. 2010. Stormwater monitoring resources. Access at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/strmH2Omonitoring.html.

Guidance on stormwater monitoring for construction sites.

Washington Department of Ecology. 2006. How to do Stormwater Monitoring: A guide for construction sites. Access at: http://www.ecy.wa.gov/biblio/0610020.html.

Monitoring for larger debris.

ASCE. 2010. Guideline for Monitoring Stormwater Gross Solids. Order at: http://www.asce.org/Product.aspx?id=2147485997.



Monitoring projects will help advance the development of a focused approach to stormwater management on FWS managed lands that is responsive to the Service's mission.

Similar to managed wetlands, stormwater facilities should be periodically monitored for performance and to inform adaptive management and maintenance regimes.

USFWS

SM-4 Promote Stewardship of Aquatic Resources

Intent

Low impact development (LID) facilities for stormwater management serve the functional purposes of cleaning and slowing or retaining stormwater runoff and protecting our aquatic resources. Additionally they can help to raise public awareness and understanding of the relationship of roadways to aquatic resources, wildlife and habitat conservation. Stormwater facilities can be designed to reveal to and educate visitors about the impacts of development on aquatic resources. Facilities can communicate how they protect aquatic resources, and can influence behavior and management practices beyond FWS managed lands in support of the Service's mission.

Principles

- Prioritize aesthetic and educational components of highly visible stormwater management facilities
- Use stormwater facilities to communicate stewardship commitment of FWS
- Design stormwater facilities with native plants in arrangements that respond to multiple objectives, including management, educational/ interpretive, aesthetic and maintenance goals
- Make stormwater part of the site's interpretive story and reveal the process of stormwater quantity and quality controls to the extent possible
- Consider educational and volunteer opportunities presented by stormwater management facilities
- Consider potential benefits or drawbacks of additional wetland habitat areas created by natural drainage facilities

Metrics

- "Friends" groups involvement & awareness
- Production/use of interpretive materials or content
- Use of stormwater facilities as positive examples or success stories (e.g. in public media, professional circles, within FWS)

Resources

Social benefits of road and highway systems.

AASHTO. 2008. Above and Beyond: The Environmental and Social Contributions of America's Highway Programs.

Promotional information for visitors to FWS sites.

USFWS. 2005. Byways to America's Wildest Places: Discover Your National Wildlife Refuges.

Scenic byways guidelines with details on benefits of good road design.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Green Values calculator can help to quantify benefits from LID (aka green infrastructure) facilities.

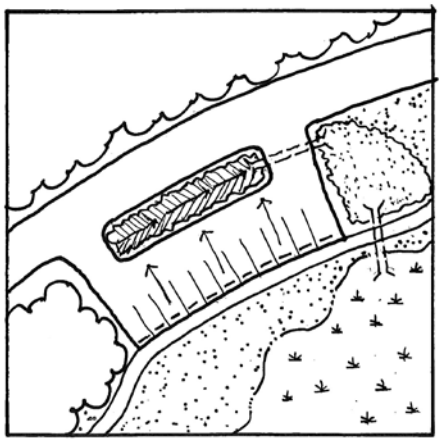
Center for Neighborhood Technology. 2010. Green Values Stormwater Management Calculator. Access at: http://greenvalues.cnt.org/

Additional resources on green infrastructure (another term that includes natural stormwater management facilities).

US EPA. 2010. Green Infrastructure: Managing Wet Weather With Green Infrastructure (website). Access at: http://cfpub.epa.gov/npdes/home.cfm?program_id=298.

Report examining social, economic, and environmental benefits of green infrastructure.

Stratus Consulting. 2009. A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia's Watersheds.



Stormwater treatment facilities integrated into roadways provide places where FWS stewardship of aquatic resources can be demonstrated.

Stormwater facilities can be an important part of visitor experience, providing interpretive opportunities (top) and allowing visitors hands-on experience planting or maintaining native vegetation (bottom).

Justin Martin

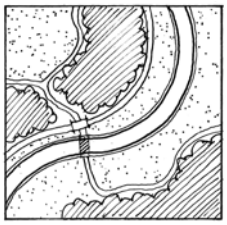
USFWS

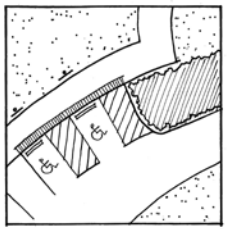
Visitor Experience

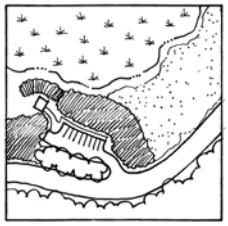
Visitor Experience
Overview

Engaging the Public

Conservation of fish, wildlife, plants and their habitats is at the core of the Service's mission. Providing public access compatible with conservation goals is paramount to achieving this mandate. Roadways are the primary infrastructure elements that facilitate public access to FWS managed lands. Conversely, landscapes without roads or limited or restricted public access on roads can support protection of sensitive habitats when necessary. This section is intended to help you consider how best to provide access to FWS managed lands. Well-designed roadways on FWS lands can help demonstrate to visitors how the Service's mission is carried out at the landscape scale.







Scenic roadways offer visitors a glimpse into the habitat areas that the Service manages, helping to inspire an ethic of stewardship and conservation among the public. Roadways should be designed to afford such experiences and to convey a sense of place that is unique to each site and destination. They should take into account both the natural and cultural histories of the land they traverse, revealing but not destroying special places and artifacts along the way. This section of the guidelines will point you to resources to help with design solutions focused on the visitor's experience. Design of roadway elements such as safety and guiding features, interpretive signs and visitor facilities should be relevant and specific to the region, if not to the individual site or refuge.

National Wildlife Refuges, Fish Hatcheries and other FWS managed lands are national treasures. Facilities there should help visitors connect with the natural heritage that the Service works to conserve.

VE-1 Preserve and Highlight Scenic Value

Intent

The scenic value of wildlife refuges plays an important role in the visitor experience. Road alignments should be chosen or revised carefully so as to preserve the scenic value of the journey. Roadway alignments and locations on FWS managed lands should afford views and simultaneously prevent roadways from becoming dominant features of the visual landscape.

Principles

- Consider designs that respond to the character of the landscape and management practices. For example, an entrance road may offer a change in design speed, scale and geometry in order to help visitors decompress from previous highway travel
- Provide appropriate orientation and directional signage in a style that fits with the local character and landscape
- Consider and plan the viewsheds and impacts of roadways on the visual and auditory landscape
- Consider and plan coherent and consistent design elements with the facility (color, texture, form)
- Consider the entry experience (does it welcome and orient visitors?) and sequence of visitor experiences when arriving at FWS managed lands or high use areas such as visitor centers
- Consider opportunities for interpreting culture and the landscape along the corridor
- Provide safe places, such as overlooks and viewpoints, to enjoy scenery

Metrics

- Visual resource analysis/ management - USFS or BLM methodologies (see Resources below)

Resources

Scenic byways guidelines with details on benefits of good road design.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Study on context sensitive roadway design from New Mexico.

New Mexico Department of Transportation. 2006. Architectural and Visual Quality Design Guidelines for Context Sensitive Design and Context Sensitive Solutions.

Roadside treatment design guidelines.

FHWA. 2008. Safe and Aesthetic Design of Urban Roadside Treatments.

Regional guidelines for roadside development.

ODOT. 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Design guidance based on human behavior patterns.

Transportation Research Board of The National Academies. 2008. Human Factors Guidelines for Road Systems (NCHRP Report 600B).

USFS visual assessment technique.

USDA Forest Service. 1995 (rev. 2000). Landscape Aesthetics: A Handbook for Scenery Management. AH-701.

BLM visual assessment technique.

BLM. 2007. Visual Resource Management (website). Access at http://www.blm.gov/nstc/VRM/.

Plan roadways to afford views to areas of high scenic value.

Roadways provide or give access to scenic vistas (top) and visitor facilities such as a viewing blind at Finley NWR (bottom).

USFWS

Brian Baimson

VE-2 Promote and Facilitate Multiple Modes of Transportation

Intent

Access to FWS managed lands, where compatible with Station purpose, should be available to visitors via multiple forms of transportation, including public transit, bicycle, and walking. Alternative forms of transportation can help reduce visitors' carbon footprints, which in turn may have long term positive affects for the natural resources we manage. Planning and building to accommodate sustainable transportation options can help to achieve the FWS mission.

Principles

- Design alternative transportation facilities that are compatible with wildlife and habitat conservation
- Provide parking for bicycles and other alternative types of transportation
- Consider adding charging stations for electric vehicles
- Coordinate with other agencies or organizations that could provide public transportation to FWS managed lands
- Promote and partner to develop bicycle routes to FWS managed lands
- Consider bicycle routes through FWS managed lands where compatible with wildlife, safety, and user experience
- Consider signage or pavement markings to alert drivers to other types of road users
- Use outreach to encourage use of alternative transportation modes to and within the FWS managed lands

Metrics

- Counts of users arriving by public transportation, using bicycles, etc.
- Use rates of stationary facilities, such as special parking or bike racks

Resources

Potential funding source for transit and other alternative transportation options.

Paul S. Sarbanes Transit in Parks Program (5320). Access at: http://www.fta.dot.gov/funding/grants/grants_financing_6106.html.

Case studies for alternative transportation projects in National Parks.

See: http://www.volpe.dot.gov/nps/projects.html.

Design guidelines (see pp. 70-76).

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Potential funding for developing alternative transportation systems for visitors through the Transit in Parks Program (5230)

See: http://www.fta.dot.gov/funding/grants/grants_financing_6106.html.

Bicycling on federal lands - case studies include two National Wildlife Refuges.

FHWA. 2008. Guide to Promoting Bicycling on Federal Lands. FHWA Pub. No. FHWA-CFL/TD-08-007.

Case studies that include alternative transportation programs in parks, such as shuttle bus systems.

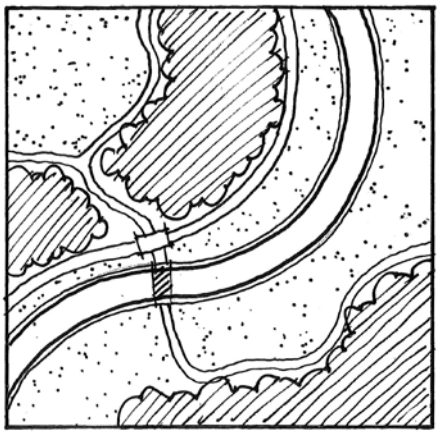
NPS Partnerships Case Studies (Transportation). See: http://www.nps.gov/partnerships/cs_type.htm#anchor19.

Lessons from Europe on traffic calming, enhancing mobility options.

Brewer, Jim, et al. 2001. Geometric Design Practices for European Roads. FHWA, Office of International Programs.

Case Study.

Tualatin River NWR. Two parking spaces designated for hybrid vehicles; bicycle racks provided at parking area; bus stop for a public transit line adjacent to the Refuge.



Providing separate facilities can encourage users who don't want to bike or walk along a roadway.

Roadway projects should facilitate multiple modes of transportation; a roadway at Ding Darling NWR (top) accommodates both autos and bikers for wildlife observation; parking lot at Great Swamp NWR visitor center (bottom) provides a safe, convenient place for bicycle parking.

USFWS

Brian Bainnson

VE-3 Comply With Accessibility Standards and Guidelines

Intent
FWS managed lands should be accessible to all. FWS is subject to accessibility standards as dictated by the Architectural Barriers Act (ABA). Project teams should use the relevant suite of resources and guidance to ensure all FWS facilities are designed and constructed to comply with or exceed the mandates of the ABA.

Principles
- Define and consider visitor expectations for accessibility
- Balance safety and accessibility concerns
- Apply all relevant design criteria in order to meet or exceed the requirements of ABA
- Consider the relationship of accessible improvements to related infrastructure. Is there a completely accessible visitor experience?

Metrics
- Compliance with requirements, guidelines and standards
- Visitor use counts
- Outcomes of DCR facility audits

Resources
See ABA accessibility standards.

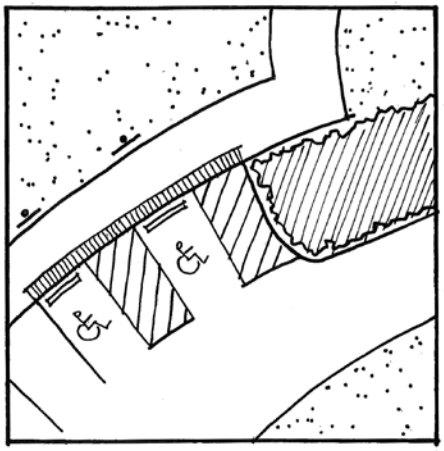
http://www.access-board.gov/gs.htm.

Draft Final Guidelines for accessibility in Outdoor Developed Areas on Federal lands:

http://www.access-board.gov/outdoor/.

Accessibility guidance for Federal outdoor areas (specific to USDA Forest Service lands/facilities).

USDA Forest Service. 2006. Accessibility Guidebook for Outdoor Recreation and Trails.



Brian Bainnson

Provide accessible parking spaces with appropriate access aisles and access to pathways (top); accessible parking at Great Swamp NWR (right).

What Federal Accessibility criteria should FWS projects follow?

The Architectural Barriers Act (ABA) of 1968
FWS is subject to the ABA. The ABA requires access to facilities designed, built, altered or leased with Federal funds. Passed by Congress in 1968, it marks one of the first efforts to ensure access to the built environment. The Access Board develops and maintains accessibility guidelines under this law. These guidelines serve as the basis for the standards used to enforce the law, the Architectural Barriers Act Accessibility Standard (ABASS).

Americans with Disabilities Act and the Architectural Barriers Act Accessibility Guidelines for Buildings and Facilities (ADAABAAG) as published in the Federal Register on July 23, 2004.
FWS should follow the scoping and technical requirements under the ABA sections. This direction covers accessibility to sites, facilities, buildings and elements by individuals with disabilities. The requirements are to be applied during design, construction, additions to and alterations of facilities.

Draft Final Accessibility Guidelines for Outdoor Developed Areas
Many FWS facilities can be characterized as Outdoor Developed Areas. The Access Board is proposing to issue accessibility guidelines for outdoor developed areas designed, constructed or altered by Federal agencies subject to the ABA of 1968. The guidelines cover trails, outdoor recreation access routes, beach access routes and picnic and camping facilities. Once these guidelines are finalized they will become the technical requirements for accessibility in outdoor developed areas. At this time, FWS may use these guidelines.

Accessibility Guidebook for Outdoor Recreation and Trails, USDA Forest Service, April 2006.
These guidelines only apply within National Forest System boundaries. However, they are a very useful tool for FWS projects recognizing that the Draft Final Accessibility Guidelines for Outdoor Developed Areas are still a work in progress.

And In General…
- Use principles of universal design—programs and facilities should be usable by all people, to the greatest extent possible, without separate or segregated access for people with disabilities.
- Accessibility does not supersede requirements for safety.
- Consider the level of development at a site to help balance safety and accessibility.

VE-4 Facilitate Compatible Wildlife Dependent Recreation and Education

Intent

The FWS mission is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. The mission of the Service should be integrated and transparent in the design of roadways on FWS managed lands. Roadways are key in fulfilling the Service's priority of connecting people with nature, and can provide opportunities to do so in ways that are compatible with the conservation mission of the Service.

Principles

- Consider whether current or anticipated visitor impacts are compatible with wildlife and their habitats
- Consider safety for visitors, staff and wildlife
- Provide orientation and interpretive information to support visitor experiences
- Consider the enabling legislation of the refuge - what is the purpose of the unit?
- Consider relationships with other recreational or educational sites within the region
- Consider demand, site carrying capacity and quality of visitor experience
- Determine what kind of access to recreation sites is available, appropriate and necessary
- Consider impacts to recreational activities from roads
- Promote appropriate facilities for safely viewing wildlife from roads where necessary
- Plan for appropriate signage, including entrance, orientation, directional and interpretive
- Consider access for and needs of school groups

Metrics

- Visitor counts
- Diversity and quality of activities available for visitors
- Ease of use (proximity, clarity, etc.) of recreational and educational elements

Resources

California State Parks Children in Nature Campaign.

http://www.parks.ca.gov/?page_id=24914.

Information on local, regional and national programs to connect kids with nature.

Children and Nature Network. See: http://www.childrenandnature.org/movement/info.

National Wildlife Federation's kids outside program.

See: http://www.nwf.org/beoutthere/.

Washington State Parks "No Child Left Inside" campaign.

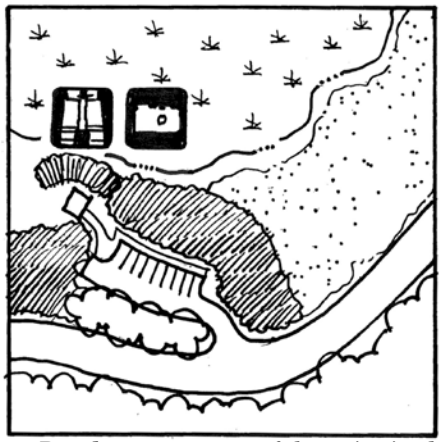
See: http://www.parks.wa.gov/NoChildLeftInside/.

USDA Forest Service Discover the Forest campaign.

http://www.discovertheforest.org/index.php.

Bicycling on federal lands - case studies include two National Wildlife Refuges.

FHWA. 2008. Guide to Promoting Bicycling on Federal Lands. FHWA Pub. No. FHWA-CFL/TD-08-007.



Roadways are one of the principal infrastructure elements that facilitate access to the Big 6 on FWS managed lands.

The Big Six

The 1997 Refuge System Improvement Act outlines "The Big Six" priority public uses for Refuge system improvements:

- Hunting
- Fishing
- Wildlife Photography
- Wildlife Observation
- Environmental Interpretation
- Environmental Education

Auto tour route at Ridgefield NWR provides visitors access to Big 6 activities, such as wildlife observation and photography.

USFWS

Appendices

Appendix A: Bibliography

LE - Landscape Ecology

Bentrup, G. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: Department of Agriculture, Forest Service, Southern Research Station. 110 p. Access at http://www.unl.edu/nac/bufferguidelines/.

Climate Impacts Group. 2009. The Washington Climate Change Impacts Assessment. University of Washington. Seattle, WA.

Dashiell and Lancaster. Undated. Road Design Guidelines for Low Impact to Hydrology. Five Counties Salmonid Conservation Program. Weaverville, CA.

Dramstad, Wenche, James Olson and Richard Forman. 1996. Landscape Ecology Principles in Landscape Architecture and Land-Use Planning. Harvard GSD and Island Press. Washington, DC.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Best Practices Manual. Access at http://www.fhwa.dot.gov/environment/hconnect/wvc/index.htm.

Forman, Richard. "Roadsides and Vegetation." 2002. In Proceedings of the International Conference on Ecology and Transportation, Keystone, CO, September 24-28, 2001. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University (March 2002): 85-91.

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions. Island Press. Washington, D.C.

Green Highways Partnership. http://www.greenhighwayspartnership.org.

Jones, Grant R., David F. Sorey and Charles C. Scott. 2007. Applying Visual Resource Assessment for Highway Planning. In Landscape Architecture Graphic Standards (pp.130-139). Hoboken, New Jersey: John Wiley & Sons.

Jones, Grant R. and Charles C. Scott. 2007. Road Alignment. In Landscape Architecture Graphic Standards (pp.330-341). Hoboken, New Jersey: John Wiley & Sons.

Kentucky Transportation Center. Undated. Context-Sensitive Design Case Study No. 1: Paris Pike - Kentucky. College of Engineering, University of Kentucky. Lexington, KY.

Nevada Department of Transportation. 2002. Pattern and Palette of Place: A Landscape and Aesthetic Master Plan for the Nevada State Highway System.

New Mexico Department of Transportation. 2006. Architectural and Visual Quality Design Guidelines for Context Sensitive Design and Context Sensitive Solutions.

ODOT (Oregon Department of Transportation). 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Sperling, Daniel and Deborah Gordon. 2008. Two Billion Cars: Transforming a Culture. In: TR News, No. 259 (Nov-Dec).

Transportation Research Board of The National Academies. 1997. Toward A Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology (SR 251).

Transportation Research Board of The National Academies. 2002. A Guide to Best Practices for Achieving Context Sensitive Solutions (NCHRP Report 480).

Transportation Research Board of The National Academies. 2008. Potential Impacts of Climate Change on US Transportation (TRB Report 290).

TransTech Mgmt., Oldham Historic Properties Inc. and Parsons Brinckerhoff Quade & Douglas for National Cooperative Highway Research Program. 2004. Performance Measures for Context Sensitive Solutions - A Guidebook for State DOT's.

Trombulak, Stephen and Christopher Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology 14(1), February 2000, pp. 18-30.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

USDA Forest Service, Stream-Simulation Working Group. 2008. Stream Simulation: An Ecological Approach To Providing Passage for Aquatic Organisms at Road-Stream Crossings.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Western Governors' Wildlife Council. http://www.westgov.org/. Resources include the Wildlife Corridors Initiative Report (2008) and Wildlife Sensitivity Maps.

PC - Planning Context

AASHTO. 2008. Guidelines For Environmental Performance Measures. NCHRP 25-25, Task 23. Prepared by Cambridge Systematics, Inc. Cambridge, MA.

Florida Department of Transportation. 2003. Public Involvement Handbook. Available at: http://www.dot.state.fl.us/EMO/pubs/public_involvement/pubinvolve.htm.

Jones, Grant R., David F. Sorey and Charles C. Scott. 2007. Applying Visual Resource Assessment for Highway Planning. In Landscape Architecture Graphic Standards (pp.130-139). Hoboken, New Jersey: John Wiley & Sons.

Lennertz, Bill and Aarin Lutzenhiser. 2006. The Charrette Handbook. American Planning Association.

Myerson, Deborah L., AICP, 1999. Getting It Right in the Right-of-Way: Citizen Participation in Context-Sensitive Highway Design. Scenic America. http://www.scenic.org/.

NEPA information for EPA Region 10 (Pacific NW). http://yosemite.epa.gov/R10/ECOCOMM.NSF/webpage/national+environmental+policy+act.

ODOT (Oregon Department of Transportation). 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Peaks, Harold E. and Sandra Hayes. 1999. "Building Roads in Sync With Community Values." In Public Roads (Mar./Apr. 1999).

Porter, Douglas and David Salvesen, eds. 1995. Collaborative Planning for Wetlands and Wildlife: Issues and Examples. Island Press. Washington, D.C.

Transportation Research Board of The National Academies. 1997. Toward A Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology (SR 251).

Transportation Research Board of The National Academies. 2008. Potential Impacts of Climate Change on US Transportation (TRB Report 290).

TransTech Mgmt., Oldham Historic Properties Inc. and Parsons Brinckerhoff Quade & Douglas for National Cooperative Highway Research Program. 2004. Performance Measures for Context Sensitive Solutions - A Guidebook for State DOT's.

Stratus Consulting. 2009. A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia's Watersheds. Prepared for City of Philadelphia Water Department.

University of Washington and CH2MHill. 2009. Greenroads Rating System, v1.0. http://www.greenroads.us/.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

WSDOT. 2003. Building Projects that Build Communities: Recommended Best Practices.

DE - Design and Engineering

AASHTO. 2001. Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), 1st Edition. Washington, D.C.

AASHTO. 2004. A Policy on Geometric Design of Highways and Streets, 5th Edition (aka 'Green Book). Washington, D.C.

BuildCarbonNeutral. 2010. http://buildcarbonneutral.org.

Calkins, Meg. 2009. Materials for Sustainable Sites. John Wiley & Sons. Hoboken, NJ.

Center for Environmental Excellence by AASHTO - Invasive Species/Vegetation Management, Reseach, Documents & Reports web page. Access at: http://environment.transportation.org/environmental_issues/invasive_species/docs_reports.aspx.

Crane, Bill. 2006. Road Maintenance with Threatened, Endangered, or Sensitive Plants: Finding Solutions. 0677 1807P. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 60 p.

Ferguson, Leslie, Celestine L. Duncan and Kathleen Snodgrass. 2003. Backcountry Road Maintenance and Weed Management. 0371 2811. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 22 p.

FHWA. 2007. Roadside Revegetation: An Integrated Approach to Establishing Native Plants. FHWA-WFL/TD-07-005. Vancouver, WA.

FHWA. Undated. Flexibility in Highway Design. FHWA Pub. No. FHWA-PD-97-062. http://www.fhwa.dot.gov/environment/flex/index.htm.

Forman, Richard, et al. 2003. Road Ecology: Science and Solutions. Island Press. Washington, D.C.

Harper-Lore, Bonnie and Maggie Wilson, editors. 2000. Roadside Use of Native Plants. Island Press. Washington, D.C.

Jones, Grant R., David F. Sorey and Charles C. Scott. 2007. Applying Visual Resource Assessment for Highway Planning. In Landscape Architecture Graphic Standards (pp.130-139). Hoboken, New Jersey: John Wiley & Sons.

Kentucky Transportation Center. Undated. Context-Sensitive Design Case Study No. 1: Paris Pike - Kentucky. College of Engineering, University of Kentucky. Lexington, KY.

ODOT (Oregon Department of Transportation). 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Reyff, James. 2009. Reducing Underwater Sounds with Air Bubble Curtains. TR News, No. 262 (May-June).

Ruiz, Leo. 2005. Guidelines for Road Maintenance Levels. 0577 1205P. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 71 p.

Skorseth and Selim. 2000. Gravel Roads Maintenance and Design Manual. South Dakota Local Transportation Assistance Program (USDOT - FHWA).

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Sustainable Sites Initiative (SSI). http://www.sustainablesites.org/.

Transportation Research Board of The National Academies. 2008. Human Factors Guidelines for Road Systems. NCHRP Report 600B.

University of Bath. Inventory of Carbon & Energy (ICE) Wiki. http://wiki.bath.ac.uk/display/ICE/Home+Page.

University of Washington and CH2MHill. 2009. Greenroads Rating System, v1.0. http://www.greenroads.us/.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

Washington Department of Ecology. 2006. How to do Stormwater Monitoring: A guide for construction sites. Access at: http://www.ecy.wa.gov/biblio/0610020.html.

Washington Department of Ecology. 2010. Stormwater monitoring resources. Access at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/strmH2Omonitoring.html.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

Wisconsin Department of Transportation (WisDOT). 2003. Best Practices for Control of Invasive Plant Species.

WSDOT. 1997. Integrated Vegetation Management for Roadsides.

OP - Organism Passage

Arizona Game and Fish Department, Habitat Branch. 2008. Guidelines for Bridge Construction or Maintenance to Accommodate Fish & Wildlife Movement and Passage.

Beckmann, J. P., A. P. Clevenger, M. P. Huijser, and J. A. Hilty. 2010. Safe Passages. Island Press. Washington, D.C.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Best Practices Manual. http://www.fhwa.dot.gov/environment/hconnect/wvc/index.htm.

FHWA. 2008. Wildlife-Vehicle Collision Reduction Study, Report to Congress. Access at http://www.fhwa.dot.gov/publications/research/safety/08034/index.cfm.

FHWA. 2010. Keeping It Simple: Easy Ways to Help Wildlife Along Roads. http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm.

Hardy et al, Western Transportation Institute (Montana State Univ.). 2007. Evaluation of Wildlife Crossing Structures and Fencing on US Highway 93 Evaro to Polson. Phase I: Preconstruction Data Collection and Finalization of Evaluation Plan.

Henke, R.J., P. Cawood-Hellmund and T. Sprunk. 2001. Habitat connectivity study of the I-25 and US 85 corridors, Colorado. Pages 499-508. Proceedings of the International Conference on Ecology and Transportation. Keystone, Colorado, September 24-28, 2001. Center for Transportation and the Environment, North Carolina State University, USA.

Huijser et al (Western Transportation Institute - Montana State University) and Salsman and Wilson (Sensor Technologies and Systems, Inc.). 2006. Animal Vehicle Crash Mitigation Using Advanced Technology, Phase I: Review, Design And Implementation, SPR-3(076). Oregon Dept. of Transportation Research Unit. Report No. FHWA-OR-TPF-07-01.

Jacobson, Sandra, Robert Gubernick and Michael Furniss. “Combining Aquatic and Terrestrial Passage Design into a Continuous Discipline”. In Proceedings of the 2007 International Conference on Ecology and Transportation, edited by C. Leroy Irwin, Debra Nelson, and K.P. McDermott. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University, 2007. pp. 136-142. http://escholarship.org/uc/item/6w6573r8.

Mader, Sharon. 2006. Comparing the Ecological Effects of Linear Developments on Terrestrial Mammals. Wildlands CPR. Missoula, MT. http://www.wildlandscpr.org/biblio-notes/comparing-ecological-effects-linear-developments-terrestrial-mammals.

Minnesota Department of Transportation. 2009. Cost Analysis of Alternative Culvert Installation Practices in Minnesota.

Proceedings of the International Conference on Ecology and Transportation. Access biennial conference proceedings (2003, 2005, 2007, 2009) online at: http://www.icoet.net/.

Transportation Research Board of The National Academies. 2008. Evaluation and the Use and Effectiveness of Wildlife Crossings (NCHRP Report 615).

Trombulak, Stephen and Christopher Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology 14(1), February 2000, pp. 18-30.

USDA Forest Service. 2002. Management Techniques for Riparian Restorations (Roads Field Guide, Volume II).

USDA Forest Service, Stream-Simulation Working Group. 2008. Stream Simulation: An Ecological Approach To Providing Passage for Aquatic Organisms at Road-Stream Crossings.

USFWS. Unpublished. Wildlife Crossing and Aquatic Organism Passage Issues by State. Contact FWS national Refuge Roads Coordinator.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

SM - Stormwater Management

AASHTO. 2008. Above and Beyond: The Environmental and Social Contributions of America's Highway Programs.

Bentrup, G. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: Department of Agriculture, Forest Service, Southern Research Station. 110 p. Access at http://www.unl.edu/nac/bufferguidelines/.

City of Bellevue, WA. 2009. Natural Drainage Practices Maintenance Guidelines. Access at: http://www.bellevuewa.gov/pdf/Utilities/Natural_Drainage_Practices.pdf.

Dashiell and Lancaster. Undated. Road Design Guidelines for Low Impact to Hydrology. Five Counties Salmonid Conservation Program. Weaverville, CA.

Hinman, Curtis. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. Puget Sound Action Team. Olympia, WA. http://www.psparchives.com/publications/our_work/stormwater/lid/lid_tech_manual05/LID_manual2005.pdf.

Mensing and Chapman. Undated. Conservation Development and Ecological Stormwater Management: An Ecological Systems Approach. Applied Ecological Services. Prior Lake, MN.

Smith, Stacy (Idaho Technology Transfer Center, Univ. of Idaho). 2005. BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.

Stratus Consulting. 2009. A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia's Watersheds. Prepared for City of Philadelphia Water Department.

US Dept. of Defense. 2004. Unified Facilities Criteria (UFC) - Design: Low Impact Development.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

US EPA. 2002. Urban Stormwater BMP Performance Monitoring. Access online at: http://water.epa.gov/scitech/wastetech/guide/stormwater/monitor.cfm.

US EPA. 2010. Green Infrastructure: Managing Wet Weather With Green Infrastructure (website). Access at: http://cfpub.epa.gov/npdes/home.cfm?program_id=298.

USFWS. 2005. Byways to America's Wildest Places: Discover Your National Wildlife Refuges.

Weaver, William and Danny Hagans. 1994. Handbook for Forest and Ranch Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads.

WSDOT. Best Management Practices Field Guide for ESA Sec 4(d) Habitat Protection. http://www.wsdot.wa.gov/NR/rdonlyres/A0C3F307-1548-4BED-8C7B-C4A79A788791/0/BMP_Field_Guide.pdf.

Xiao, Qingfu and E. G. McPherson. 2009. Testing a Bioswale to Treat and Reduce Parking Lot Runoff. Access at: http://www.fs.fed.us/psw/programs/cufr/products/psw_cufr761_P47ReportLRes_AC.pdf.

VE - Visitor Experience

BLM. 2007. Visual Resource Management (website). Access at http://www.blm.gov/nstc/VRM/.

Brewer, Jim, et al. 2001. Geometric Design Practices for European Roads. FHWA, Office of International Programs.

California State Parks. Children in Nature Campaign. http://www.parks.ca.gov/?page_id=24914.

Children & Nature Network. Regional Campaigns and Initiatives. http://www.childrenandnature.org/movement/info.

FHWA. 2008. Guide to Promoting Bicycling on Federal Lands. FHWA Pub. No. FHWA-CFL/TD-08-007.

FHWA. 2008. Safe and Aesthetic Design of Urban Roadside Treatments. NCHRP Report 612. www.TRB.org.

National Park Service. NPS Partnerships Case Studies (Transportation). http://www.nps.gov/partnerships/cs_type.htm#anchor19.

National Wildlife Federation. 2010. Be Out There Campaign. http://www.nwf.org/beoutthere/.

New Mexico Department of Transportation. 2006. Architectural and Visual Quality Design Guidelines for Context Sensitive Design and Context Sensitive Solutions.

ODOT (Oregon Department of Transportation). 2006. Roadside Development Design Manual - Guidelines for Visual Resource Management, Landscaping, and Hardscaping (DRAFT).

Transportation Research Board of The National Academies. 2008. Human Factors Guidelines for Road Systems (NCHRP Report 600B).

US Access Board. Guidelines and Standards (ABA, ADA, etc). http://www.access-board.gov/gs.htm.

USDA Forest Service. 1995 (rev. 2000). Landscape Aesthetics: A Handbook for Scenery Management. AH-701.

USDA Forest Service. 2002. Scenic Byways: A Design Guide for Roadside Improvements.

USDA Forest Service. 2006. Accessibility Guidebook for Outdoor Recreation and Trails. Publication number 0623-2801-MTDC.

USDA Forest Service. 2010. Discover the Forest campaign. http://www.discovertheforest.org/index.php.

USDOT Federal Transit Administration. 2010. Transit in Parks Program (5230). http://www.fta.dot.gov/funding/grants/grants_financing_6106.html.

Washington State Parks. 2008. No Child Left Inside campaign. http://www.parks.wa.gov/NoChildLeftInside/.

Additional Resources

Anderson, Linda. 2005. Highway Crossing Structures for Metropolitan Portland's Wildlife. Portland State University. Portland, OR.

Bates, Ken. 2003. Design of Road Culverts for Fish Passage. Washington Dept. of Fish and Wildlife.

Cosgrove and Orrick. 2004. The Future that Never Was: Lessons from Visions of Transportation.

FHWA. 2008. Consistency In Safety-Related Design Decisions on Federal Lands Highway Jobs. FHWA Pub. No.

FHWA and USFWS. 2005. Guidance on the Federal Lands Highway Refuge Roads Program.

Green Infrastructure Wiki. 2010. Access at: http://www.greeninfrastructurewiki.com/.

Iowa State University Dept. of Civil Engineering and Minnesota Dept. of Transportation. 2005. Economics of Upgrading an Aggregate Road.

Marriott, Paul Daniel. 1998. Saving Historic Roads: Design and Policy Guidelines. Preservation Press and John Wiley & Sons, Inc.

Maryland National Capital Park and Planning Commission and The Montgomery County Department of Parks and Planning. 1996. Rustic Roads Functional Master Plan.

National Park Service. 1984. Park Road Standards.

Otto, Sandra. 2000. "Environmentally Sensitive Design of Transportation Facilities." In Journal of Transportation Engineering, 126(5) Sept/Oct, pp. 363-366.

Regional Road Maintenance Technical Working Group (Washington) Regional Road Maintenance Endangered Species Act Program Guidelines.

Robson, Sara, and James Kingery. 2006. Idaho Native Plants for Roadside Restoration and Revegetation Programs. Idaho Transportation Department.

USFWS. 2008. Project List Meeting Report: Long-Range Transportation Plan for the US Fish and Wildlife Service Lands in Region 1. Report prepared by PBS&J.

Appendix B: Glossary

Abbreviations

ABA Architectural Barriers Act

ABAAS Architectural Barriers Act Accessibility Standards

ADA Americans with Disabilities Act

ASCE American Society of Civil Engineers

BGEPA Bald and Golden Eagle Protection Act

BLM Bureau of Land Management

CCP Comprehensive Conservation Plan

CFR Code of Federal Regulations

DCR Division of Diversity and Civil Rights (FWS Region 1)

EE Environmental Education

ES Ecological Services

ESA Endangered Species Act

FHWA Federal Highway Administration

FWCA Fish and Wildlife Coordination Act

FWS U.S. Fish & Wildlife Service (also Service, USFWS)

GIS Geographic Information System

LID low impact development

LOS level of service

LRTP Long Range Transportation Plan

MBTA Migratory Bird Treaty Act

NDS natural drainage system

NEPA National Environmental Policy Act

NWR National Wildlife Refuge (also Refuge).

NWRS National Wildlife Refuge System

ODOT Oregon Department of Transportation

R1 Region 1 of the FWS (HI, ID, OR, WA, Pacific Islands)

ROW Right-of-way

SAMMS Service Asset Maintenance Management System

USDA United States Department of Agriculture

USFS United States Forest Service

VMT Vehicle miles traveled

WDFW Washington State Department of Fish and Wildlife

WSDOT Washington State Department of Transportation

WSPRC Washington State Parks and Recreation Commission

WVC Wildlife-vehicle collisions

Definitions

Adaptive Management. Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alternative. Alternatives are different means of accomplishing Refuge purposes and goals and contributing to the System mission (draft Service Manual 602 FW 1.5). The no action alternative is the manner in which the refuge is currently managed, while the action alternatives are all other alternatives.

Bald and Golden Eagle Protection Act (Federal). This law makes it illegal for anyone to take (as defined therein) a bald or golden eagle, or their parts, nests, or eggs except as authorized under a permit. Since this law extends protection to eagle nests, it may come into play during the construction and maintenance of transportation infrastructure.

Biological Diversity (also Biodiversity). The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes.

Biological Integrity. Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities (NWRS Biological integrity policy).

Compatible Use. A wildlife-dependent recreational use or any other use of a Refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan. A document that describes the desired future conditions of the Refuge, and provides long-range guidance and management direction for the Refuge manager to accomplish the purposes of the refuge, contribute to the mission of the System, and to meet other relevant mandates (Service Manual 602 FW 1.5).

Contaminants (also Environmental Contaminants). Chemicals present at levels greater than those naturally occurring in the environment resulting from anthropogenic or natural processes that potentially result in changes to biota at any ecological level (USGS, assessing EC threats to lands managed by USFWS). Pollutants that degrade other resources upon contact or mixing (Adapted from Webster's II).

Cooperative Agreement. This is a simple habitat protection action, in which no property rights are acquired. An agreement is usually long term but can be modified by either party. They are most effective in establishing multiple use management of land. An example would be a wildlife agreement on a Corps reservoir.

Context Sensitive Solutions (CSS). A theoretical and practical approach to transportation decision-making and design that takes into consideration the communities and lands through which streets, roads, and highways pass ("the context"). CSS seeks to balance the need to move vehicles and other transportation modes efficiently and safely with other desirable outcomes, including historic preservation, environmental goals such as wildlife and habitat conservation and the creation of vital public spaces.

Critical Habitat. Areas that are essential to the conservation of ESA listed species.

Cultural Resources. The physical remains, objects, historic records and traditional lifeways that connect us to our nation's past (USFWS, Considering Cultural Resources).

Disturbance. Significant alteration of habitat structure or composition. May be natural (e.g. fire) or human-caused events (e.g. aircraft overflights).

Ecosystem. A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.

Ecosystem Management. Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and that basic ecosystem processes are perpetuated indefinitely.

Environmental Assessment. A concise public document, prepared in compliance with the National Environmental Policy Act (NEPA), that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether an environmental impact statement must be prepared, or a finding of no significant impact can be issued (40 CFR 1508.9).

Endangered Species Act (Federal). The purpose of the ESA is to protect and recover endangered and threatened species and the ecosystems upon which they depend. Under the ESA, species may be listed as either endangered or threatened and critical habitat may be designated.

ESA Listed Species. A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range (endangered) or likely to become so within the foreseeable future (threatened).

Environmental Education Facility. A building or site with one or more classrooms or teaching areas and environmental education resources to accommodate groups of students.

Fish and Wildlife Coordination Act (Federal). This law provides the basic authority for the FWS to evaluate impacts to all fish and wildlife from proposed water resource development projects. This law may come into play for transportation projects that involve effects to a water body(ies).

Gap Analysis. Analysis done to identify and map elements of biodiversity that are not adequately represented in the nation's network of reserves. It provides an overview of the distribution and conservation status of several components of biodiversity, with an emphasis on vegetation and terrestrial vertebrates (Cassidy et al.1997).

Goal. Descriptive, open-ended and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Green infrastructure. A concept and approach in which natural assets are managed and/or designed to provide multiple ecosystem and human services, including services such as stormwater management, flood prevention, carbon sequestration, and habitat. Green infrastructure includes natural drainage systems (NDS) and may be applied as a tool in achieving low impact development (LID).

Habitat. Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Habitat Connectivity (Also Landscape Connectivity). The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation/habitat. The opposite of fragmentation (Turnbull NWR Habitat Management Plan).

Habitat Management Plan. A plan that guides Refuge activities related to the maintenance, restoration, and enhancement of habitats for the benefit of wildlife, fish, and plant populations.

Habitat Restoration. Management emphasis designed to move ecosystems to desired conditions and processes and/or to healthy ecosystems.

Historic Conditions. Composition, structure and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape (NWRS Biological integrity policy).

Hydrologic influence. Having an effect on water quality and quantity.

Hydrology. A science dealing with the properties, distribution and circulation of water on and below the earth's surface and in the atmosphere (yourdictionary.com).

Indicator. Something that serves as a sign or symptom (Webster's II).

Interpretation. A teaching technique that combines factual information with stimulating explanation (yourdictionary.com). Frequently used to help people understand natural and cultural resources.

Interpretive Trail. A trail with informative signs, numbered posts that refer to information in a brochure, or where guided talks are conducted for the purpose of providing factual information and stimulating explanations of what visitors see, hear, feel, or otherwise experience while on the trail.

Landform. A natural feature of a land surface (yourdictionary.com).

Landscape Linkages. Landscape features linking areas of similar habitat. Plants and smaller animals are able to use landscape linkages to move between larger landscape blocks over a period of generations.

Landscape Ecology. The science and study of the relationship between spatial pattern and ecological processes on a wide variety of landscape scales and organizational levels.

Low Impact Development (LID). A stormwater management strategy that emphasizes conservation and use of existing natural site features integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns. (LID Guidance Manual for Puget Sound).

Maintenance. The upkeep of constructed facilities, structures and capitalized equipment necessary to realize the originally anticipated useful life of a fixed asset.

Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment, periodic condition assessment; periodic inspections, adjustment, lubrication and cleaning (non-janitorial) of equipment; painting, resurfacing, rehabilitation; special safety inspections; and other actions to assure continuing service and to prevent breakdown.

Mesh Size. The average area or diameter of the polygons enclosed by a road network, as in a fishnet; it is proportional to road density but focuses on the enclosed parcels rather than the roads (Forman 2003).

Migratory Bird Treaty Act (Federal). This law makes it illegal for anyone to take any migratory bird, or the parts, nests, or eggs of migratory birds, except under the terms of a valid permit issued pursuant to federal regulations. This law can come into play during the maintenance and removal of transportation infrastructure as well as during the construction of new structures.

Mission Statement. Succinct statement of a unit's purpose and reason for being.

Monitoring. The process of collecting information to track changes of selected parameters over time.

National Environmental Policy Act of 1969 (NEPA). Requires all Federal agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Register of Historic Places. The Nation's master inventory of known historic properties administered by the National Park Service. Includes buildings, structures, sites, objects and districts that possess historic, architectural, engineering, archeological, or cultural significance at the national, state and local levels.

National Wildlife Refuge (also Refuge). A designated area of land, water, or an interest in land or water within the System.

National Wildlife Refuge System (NWRS; also System). Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.

Native. With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem (NWRS Biological integrity policy).

Natural Drainage System (NDS). A set of stormwater management features using plants and specialized soils that slow and infiltrate stormwater and can help remove pollutants through filtration and bioremediation. These features—such as open, vegetated swales, stormwater cascades and small rain gardens or wet ponds—mimic or restore natural functions impeded by development. In contrast to pipes and vaults, these systems increase in functional value over time.

Non-Consumptive Recreation. Recreational activities that do not involve harvest, removal or consumption of fish, wildlife or other natural resources.

Noxious Weed. A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Nutrient Loading. The presence of nutrients, such as nitrogen and phosphorus, in waterways insufficient amounts to cause effects such as algal blooms and oxygen depletion, with potentially lethal effects on fish and wildlife species.

Operations. Activities related to the normal performance of the functions for which a facility or item of equipment is intended to be used. Costs such as utilities (electricity, water, sewage) fuel, janitorial services, window cleaning, rodent and pest control, upkeep of grounds, vehicle rentals, waste management and personnel costs for operating staff are generally included within the scope of operations.

Outreach. The process of providing information to the public on a specific issue through the use of the media, printed materials and presentations.

Plant Community. An assemblage of plant species unique in its composition that occurs in particular locations, under particular influences, which reflect or integrate the environmental influences on the site, such as soils, temperature, elevation, solar radiation, slope, aspect and rainfall.

Preferred Alternative. This is the alternative determined (by the decision maker) to best achieve the Refuge purpose, vision and goals; that best contributes to the System mission and addresses the significant issues; and that is consistent with principles of sound fish and wildlife management.

Priority Public Uses. Hunting, fishing, wildlife observation and photography, environmental education and interpretation were identified by the National Wildlife Refuge system Improvement Act of 1997 as the six ("Big Six") priority public uses of the National Wildlife Refuge System.

Public. Individuals, organizations, and groups outside the planning team, including officials of Federal, State, and local government agencies, Indian tribes and foreign nations. It includes those who may or may not have indicated an interest in Service issues and those who may be affected by Service decisions.

Refuge Purpose(s). The purpose(s) specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, a refuge unit, or refuge subunit (Draft Service Manual 602 EW 1.5).

Restoration. The act of bringing back to a former or original condition (Webster's II).

Riparian. An area or habitat that is transitional from terrestrial to aquatic ecosystems, including streams, lakes, wet areas, and adjacent plant communities and their associated soils which have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; and of or relating to a river. Specifically applied to ecology, "riparian" describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes any and all plant life growing on the land adjoining a stream and directly influenced by the stream.

Road Density. The average total road length per unit area of landscape (i.e. kilometers per square km, or miles per square mile) (Forman 2003).

Road-Effect Zone. The zone of influence of a roadway into the surrounding areas. Distance depends upon the type of effect and site conditions (Forman 2003; see graphic, p. 308).

Roadway. The suite of typical improvements associated with a vehicle-focused transportation project. This extends from the centerline of an existing or proposed road outward, to include associated infrastructure components such as paving, utilities, grading and planting. Roadway also refers here to other facilities and infrastructure commonly associated with vehicular transportation, such as parking, visitor contact facilities and pullouts. From an ecological perspective, the roadway conceptually includes impacts such as habitat fragmentation, habitat disturbance, pollution, and aquatic and terrestrial species conflicts.

Strategy. A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.5).

Viewpoint. A designated point that provides an opportunity to see wildlife or habitats of interest. The point may or may not be "supported" with an interpretive sign. Usually the viewpoint is supported by a pullout or a parking area.

Visitor Center. A building with staff that provides visitors with interpretation, education and general information about the natural and cultural resources of the Refuge and the local area.

Visitor Contact Point or Center. A kiosk or other location where visitors may go to learn about Refuge resources, facilities, trails, etc.

Vision Statement. A concise statement of the desired future condition of the planning unit, based primarily upon the System mission, specific Refuge purposes and other relevant mandates (Service Manual 602 FW 1.5).

Watershed. The region or area drained by a river system or other body of water (Webster's II).

Wetlands. Transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at some time each year (Service Manual 660 FW 2).

- Permanent wetland - a wetland basin or portion of a basin that is covered with water throughout the year in all years except extreme drought. Typically, the basin bottom is vegetated with submerged aquatic plant species, including milfoil, coontail and pondweeds.

- Semi-permanent wetland - a wetland basin or portion of a basin where surface water persists throughout the growing season of most years. Typical vegetation is composed of cattails and bulrushes.

- Seasonal wetland - a wetland basin or portion of a basin where surface water is present in the early part of the growing season but is absent by the end of the season in most years. Typically vegetated with sedges, rushes, spikerushes or burreed.

Wildlife-Dependent Recreation. Hunting, fishing, wildlife observation and photography, environmental education and interpretation. These are also referred to as the priority public uses of the National Wildlife Refuge System or "Big Six".

U.S. Department of the Interior
U.S. Fish and Wildlife Service

http://www.fws.gov

February 2011

Appendix E

Glossary of Terms

Glossary of Terms

Alternative transportation in parks and public lands program (ATPPL) – Congress established the ATPPL program to enhance the protection of national parks and federal lands and increase the enjoyment of those visiting them. Administered by the Federal Transit Administration in partnership with the Department of the Interior and the Forest Service, the program funds capital and planning expenses for alternative transportation systems such as shuttle buses and bicycle trails in national parks and public lands. The goals of the program are to conserve natural, historical, and cultural resources; reduce congestion and pollution; improve visitor mobility and accessibility; enhance visitor experience; and ensure access to all, including persons with disabilities.

Asset management – Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost effectively. It includes preservation, upgrading and timely replacement of assets, through cost effective management, programming, and resource allocation decisions. Asset management combines engineering principles with sound business practices and economic theory, and provides tools to facilitate a more organized, logical approach to decision making.

Asset priority index (API) – API is a SAMMS metric used by field station managers to assess how critical each property asset is to accomplishing the FWS mission and goals. FWS uses the API to ensure that maintenance activities and projects proposed for funding are focused on highest priority assets. Similarly, the API is used to identify lowest priority assets for disposal.

Best management practices (BMPs) – BMPs are effective, practical, structural or nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides, and other pollutants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects of human activities. These practices are developed to achieve a balance between water quality protection and the production of wood crops within natural and economic limitations.

Congestion management system (CMS) – The CMS is a systematic approach, used by the U.S. Fish and Wildlife Service and other land management agencies that provides for the safe and effective management and operation of new and existing transportation facilities through the use of demand reduction and operational management strategies. The CMS represents the state-of-the-practice in addressing congestion, by providing information on transportation system performance, and alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet Federal, State and local needs.

Context sensitive solutions (CSS) – CSS is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist.

Comprehensive Conservation Plan (CCP) – CCPs are planning documents developed for individual FWS wildlife refuges to provides a description of the desired future conditions and long-range guidance for the project leader to accomplish purposes of the refuge system and the refuge. CCPs establish management direction to achieve refuge purposes.

Comprehensive Hatchery Management Plan (CHMP) – CHMPs are operational management plans specific to fish hatcheries that are developed to outline policies and objectives relevant to the overall management of a specific fish hatchery. These documents are used as planning reference tools, to help integrate FWS objectives and priorities with those of other agencies; fulfill obligations under the Endangered Species Act and other management programs; identify and define specific hatchery reforms to implement; and provide a foundation for future program and budget development.

Core Team – This group serves as the project steering committee for the development of this Long Range Transportation Plan for FWS Lands in Region 1. The groups is composed of representatives from regional and headquarters offices of U.S. Fish and Wildlife Service and planning leadership from the Federal Highway Administration Federal Lands Highway Division.

Cultural landscape – The cultural landscape refers to a geographic area, including both cultural and natural elements, associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values.

Cultural resources – Cultural resources include properties such as landscapes or districts, sites, building, structures, objects, or cultural practices that are usually greater than 50 years of age and possess architectural, historic, scientific, or other technical value. By their nature, these resources are non-renewable.

Deferred maintenance (DM) – Maintenance that was not performed when it should have been or when it was scheduled and, therefore, was put off or delayed for a future period.

Extended Team – This group serves as technical resource experts and key stakeholders from the U.S. Fish and Wildlife Service and Federal Land Highways, providing technical assistance and local context knowledge to the Core Team for the Long Range Transportation Plan for FWS lands in Region 1.

Facility condition index (FCI) – FCI is the ratio of the deferred maintenance costs to replacement value. This ratio is generated from data generated from condition assessments. This is an industry accepted indicator of the overall health of facility infrastructure.

Federal Lands Highway Program (FLHP) – The FLHP was created by the 1982 Surface Transportation Assistance Act and is administered through the Office of Federal Lands Highway which provides program stewardship and transportation engineering services for planning, design, construction, and rehabilitation of the highways and bridges that provide access to and through federally owned lands. The primary purpose of the FLHP is to provide financial resources and technical assistance for a coordinated program of public roads that service the transportation needs of Federal and Indian lands.

Fisheries Program – The FWS Fisheries Program partners with states, Native American Tribes, and other interested groups to restore and maintain fish and other important aquatic resources at self-sustaining levels and to support federal mitigation programs for the benefit of the American public. FWS takes a holistic approach to fishery conservation focusing on an array of scientific fishery management and conservations efforts. Region 1 in particular has a large concentration of fishery facilities due to the rich and diverse fish population native to the waters in the region. The region maintains a network of 32 fishery field stations.

Intelligent Transportation Systems (ITS) –ITS is a general term applied to a broad range of diverse technologies known collectively as intelligent transportation systems. They are built on a number of technologies, including information processing, communications, control, and electronics. Effectively integrating these technologies in our transportation system will save lives, time, and money. They provide the intelligent link between travelers, vehicles, and the physical transportation infrastructure. Examples include the use of ITS to: collect and transmit information on traffic conditions and transit schedules for travelers before and during their trips; alert travelers to hazards and delays so they can change their plans to minimize inconvenience and additional strain on the system; decrease congestion by reducing the number of traffic incidents, clearing them more quickly when they occur, and rerouting traffic flow around them; and assist drivers in reaching a desired destination with navigation systems enhanced with pathfinding, or route guidance.

Intergovernmental agreement (IGA) – An IGA is a formal contract between two or more jurisdictions under which governmental agencies agree to provide a service, perform a function or provide funding to another governmental agency under specific terms, as defined in the contract. For example, an agency may contract with another entity for law enforcement services. Intergovernmental agreements may also take the form of a joint service agreement where two or more jurisdictions join forces to plan, finance and deliver a service within the boundaries of all participating jurisdictions. Agencies may also enter into various types of service exchange arrangements under which participating jurisdictions agree to lend services to one another, generally without any payment being required.

Level of service (LOS) – Roadway traffic congestion is expressed in terms of LOS as defined by the Highway Capacity Manual. Operational LOS is a congestion measure used to describe service quality and is related to the density of the traffic stream. Freeflow conditions with no restrictions are described as LOS A. LOS B through D conditions demonstrate progressively worse traffic conditions. LOS F represents a breakdown in traffic flow, characterized by the familiar traffic jam.

Long Range Transportation Plan (LRTP) – The LRTP is a long-term blueprint of a region's transportation system. Usually LRTPs are conducted every five years and are plans for twenty to thirty years into the future. The plan identifies and analyzes transportation needs of the metropolitan region and creates a framework for project priorities. These plans are normally the product of recommendations and studies carried out and put forth by a Metropolitan Planning Organization (MPO).

Metropolitan Planning Organization (MPO) – A MPO is a transportation policy-making organization made up of representatives from local government and transportation authorities. In 1962, the United States Congress passed legislation that required the formation of an MPO for urbanized areas with a population greater than 50,000. Congress created MPOs in order to ensure that existing and future expenditures for transportation projects and programs are based on a continuing, cooperative and comprehensive ("3-C") planning process. Federal funding for transportation projects and programs are channeled through this planning process.

Mission critical – Mission critical refers to a road or facility that is vitally important to meet mission of the FWS.

Multimodal transportation – The term multimodal refers to all forms of motorized and non motorized transport including cars, trucks, buses, boats, planes, bicycles, and pedestrians, etc.

National Highway Planning Network (NHPN) – The National Highway Planning Network (NHPN) is a 1:100,000 scale network database that contains line features representing just over 450,000 miles of current and planned highways in the U.S. The NHPN consists of interstates, principal arterials, and rural minor arterials.

National Park Service (NPS) – The National Park Service was created by an Act signed by President Woodrow Wilson on August 25, 1916. The National Park Service is a bureau of the Department of the Interior. Directly overseeing its operation is the Department's Assistant Secretary for Fish and Wildlife and Parks.

Natural resources – Natural resources include features and values found in nature such as plants and animals, water, air, soils, topographic features, geologic features, paleontologic resources, natural quiet, and clear night skies that are worthy of preservation.

Project Leaders – The Project Leader is responsible to the refuge or refuge complex Regional Director for the safe and efficient implementation of activities within their unit, including cooperative activities with other agencies or landowners, in accordance with delegations of authorities.

Real property inventory (RPI) – The RPI contains information on all fixed assets with a replacement cost of $5,000 or more. These fixed assets include such items as buildings, roads, bridges, levees, water management structures, fish raceways, boardwalks, fences, and other structures and facilities. The FWS collects data annually and report it to the General Services Administration.

Refuge Road Program – The Refuge Roads program was created under the 1998 Transportation Equity Act for the 21st Century (TEA-21). That act and the subsequent passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) provides authorization for National Wildlife Refuge System roads under the Federal Lands Highway program (FLHP). Through the refuge road program, $29 million annually is authorized for spending on maintenance and improvements on Refuge Roads within the National Wildlife Refuge System. This includes project planning and contract administration as well as construction. Enhancements such as comfort stations, parking lots, bicycle/ pedestrian facilities and interpretive signage related to roads are also allowable.

Regional Transportation Planning Organization (RTPO) – A RTPO is formed through a voluntary association of local governments within a county or contiguous counties. RTPO members include cities, counties, tribes, ports, transportation service providers, private employers and others. MPOs and RTPOs serve the same basic transportation planning functions – to develop a long-range transportation plan, coordinate within a region, and prepare a transportation improvement program. RTPOs are specific to the state of Washington. However, other states have similar regional transportation planning entities that serve this same purpose.

Road Inventory Program (RIP) – The FWS currently manages over 4,900 miles of public roads in the 50 states, Puerto Rico, Virgin Islands and Guam. Approximately 8% of the roads are paved. The remaining 92% are gravel or native material. The value of these assets is estimated at $1.5 billion. The Federal Lands Highways Division (FLHD) conducts an inventory and condition assessment of all public roads and parking lots on national wildlife refuges and national fish hatcheries over a five year period. This inventory and condition assessment serves as the FWS's basic public use road management system. It provides a benchmark from which the FWS is able to document the status, condition, funding needs and improvements of the public roads.

Road safety audit (RSA) – A road safety audit is a formal safety performance examination of an existing or future road or intersection by an independent audit team.

Service Asset Maintenance Management System (SAMMS) – SAMMS is an asset management database that documents facility and equipment deficiencies, justifies budget requests for maintenance needs, and provides a sound basis for management decision-making. Property inventory data is maintained as part of the SAMMS to aid in completing inspection and maintenance activities and quantify the complete picture of facilities and equipment owned by FWS. This tool allows field station managers obtain accurate and current information on all real and personal property for which they are responsible. Two types of inventories are conducted and maintained within SAMMS, a Real Property Inventory and a Personal Property Inventory.

Statewide Transportation Improvement Program (STIP) – The STIP is a prioritized, multi-year program for the implementation of transportation improvement projects. As such, it serves as a management tool to ensure the most effective use of funding for transportation improvements. The STIP is a requirement of the transportation planning process, legislated by the SAFETEA-LU. Traditional state sponsored transportation improvements are not eligible for federal funding unless they are listed in the STIP.

Transportation Improvement Program (TIP) – The TIP is a program prepared by a metropolitan or rural planning organization that lists projects to be funded with FHWA/FTA funds for the next one- to three-year period.

Transportation infrastructure – Transportation infrastructure includes roads, bridges, sidewalks, trails (paved and unpaved, front country and back country), waterways, etc.

Transportation planning – Transportation planning for land management incorporates a continuing, comprehensive, and collaborative process to encourage and promote the development of multimodal transportation systems to ensure safe and efficient movement of visitors, employees, and goods while balancing resource protection, visitor experience, and community needs.

Travel demand management (TDM) – TDM is a term given to a broad range of strategies that optimize transportation system performance for commute and non-commute trips. Strategies typically include those that encourage travelers to change their travel mode from driving alone to choosing a carpool, vanpool, public transit vehicle, or other commuter alternative. Managing travel demand focuses on providing all travelers, regardless of whether they drive alone, with choices of location, route, and time, not just mode of travel. Information technology is playing and increasingly more important role in the delivery of TDM strategies.

User capacity – As it applies to wildlife refuges and fish hatcheries, user capacity is the type and level of use that can be accommodated while sustaining the desired resource and social conditions based on the purpose and objectives of a refuge or hatchery unit.

Vehicle miles traveled (VMT) – VMT, or the total number of miles that vehicles are driven represents key data for highway planning and management, and a common measure of roadway use. Along with other data, VMT is often used in estimating congestion, air quality, and potential gas-tax revenues.

Visitor experience – The visitor experience refers to quality and perception of a visitor's visit to a wildlife refuge or fish hatchery in the context of the intended uses at a given facility (wildlife viewing, environmental education, and ease of access.

Visitor facility enhancement (VFE) – The VFE program includes improvements on FWS-owned lands aimed at enhancing wildlife viewing opportunities for the public while providing access in the form of interpretive pullouts, trails, and interpretive kiosks which provide a public benefit. Projects in this program must conserve, protect, and enhance fish, wildlife and plants for the continuing benefit of the American people, consistent with the FWS Mission.

Appendix F

Long Range Transportation Plan for the U.S. Fish and Wildlife Service Lands in Region 1 Public Involvement Plan

Public Involvement Plan

Background

U.S. Fish and Wildlife Service (Service) Region 1 is developing a long range transportation plan (LRTP) that will establish goals, and objectives for how transportation can best help the Service achieve its overarching mission of connecting people to nature at National Wildlife Refuges and National Fish Hatcheries. The purpose of this LRTP is to develop a transportation planning process model for regional level transportation planning within the Service. It will bring the Service into compliance with Federal legislation requiring Federal Land Management Agencies to conduct long-range transportation planning in a manner consistent with U.S. Department of Transportation planning practices for States and Metropolitan Planning Organizations (MPOs). The LRTP will provide Service leaders with a replicable region-level transportation planning process, benchmarks for evaluating transportation projects in an asset-informed environment across the region, and essential facts necessary for informing future planning and operational decisions.

Goals of Public Outreach and Communications

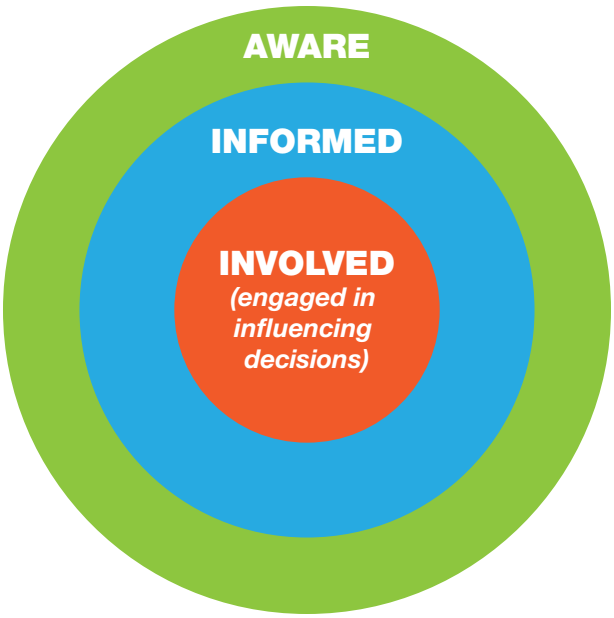
The fundamental purpose of this Public Involvement Plan (PIP) is to provide the structure for an inclusive public process that internal and external stakeholder groups may participate in during the development of the LRTP for Service Lands in Region 1. The goals of this effort include:

- Solicit input from Service staff that will inform the transportation planning effort
- Inform and educate external stakeholders about decision-making in Region 1 relative to transportation planning
- Provide opportunities for stakeholders to identify their concerns, values, ideas, and interests of the Region 1 transportation system
- Provide Service staff and external stakeholders the opportunity to review and comment on the LRTP at key decision points
- Build support from internal and external stakeholders for the processes and projects adopted under the LRTP
- Strengthen existing partnerships while forging new ones
- Identify opportunities for coordination with priority MPOs and States for short and medium term project development

Public Involvement Approach

The Service recognizes that different transportation planning efforts have varying levels of public participation throughout the decision-making processes. The context of this Region 1 LRTP canvases four western states, including remote Pacific islands. Given this geographic and demographic diversity, there cannot be an expectation that all or even most of the potential stakeholders will be able to participate, or have interest in directly influencing the outcomes of the plan. Figure 1 illustrates the varying levels of public participation for this LRTP.

Figure 1
Levels of Public Participation for Region 1 LRTP



The Service seeks to affect a large number of interested persons and groups by making them aware that the planning activities are taking place, illustrated by the large outer circle. This group will realize that the Service has a process for making transportation decisions and that there is a potential for specific transportation projects to emerge from that process (the LRTP). A somewhat smaller group will be knowledgeable about the LRTP and the transportation problems it seeks to address. For this group, the public involvement processes will be designed to inform them of rationale for the LRTP, the related decision-making processes, and the anticipated outcomes for Region 1. A much smaller group will be involved, or actively engaged in influencing the decision, represented by the small inner circle in Figure 1.

Table 1 summarizes the internal and external stakeholders the Service hopes to engage at these varying levels throughout the LRTP development. A complete listing of contact information for these stakeholders can be found in the Appendix.

Table 1
Internal and External Stakeholders in Region 1

Involved	Informed	Aware
Internal		
– Region 1 LRTP Core Team – Region 1 LRTP Extended Team (subject matter experts)	– Region 1 ARDs – Project leaders – Refuge/Hatchery supervisors – Division Chiefs – Refuge road coordinators	– Budget, contracting, and general services offices – External Affairs – Fire and Law Enforcement – Safety office – Cultural resource office – Fisheries Resource Office – Aquatic Nuisance Species coordinator – National CCP coordinator – Chiefs of Planning and Natural Resources – National Refuge Chiefs – Washington Office
External		
	– MPOs – State Departments of Transportation – U.S. Army Corps of Engineers – Bureau of Reclamation – Bureau of Indian Affairs – U.S. Forest Service – National Park Service – Bureau of Land Management – State byways – State Fish and Game agencies – Department of Defense agencies – FHWA Division offices in Region 1	– Congressional/ reauthorization staff and committees – Agencies with an MOU with the Service – State Historic Preservation Office – Collaborative Environmental Transportation Agreement for Streamlining – National Oceanic and Atmospheric Administration – U.S. Coast Guard – Federal Aviation Administration – State Parks – National Wildlife Refuge Association – Refuge and Hatchery Friends groups – Conservation Organizations – Council of University Transportation Centers – 10 total (Oregon Transportation Research and Education Consortium, etc.) – Railroads (those located within Service units) – Gateway communities – Libraries of communities around Service units – Western Governors Association – TRB Transportation Needs of Parks and Public Lands Committee – State Tourism Offices

Strategies

The strategies used to engage the public and agency groups are perhaps the most important element of a public involvement plan. Strategies are intended to target a specific audience with an intended purpose. Tables 2 and 3 summarize the primary strategies that will be used to engage both internal and external stakeholders as part of the LRTP and when each strategy will be implemented.

Table 2
Stakeholder Outreach Strategies

Task	Who	When
Internal Strategies		
Define roles and assign specific duties to the Core and Extended Teams for this public participation plan	Core team	March 30, 2009
Develop Region 1 Transportation intranet website	Holm	TBD
Internal email distribution to Informed group including link to Planning Update 1	Holm	April 2009
Hold Region-wide briefing or webinar to disseminate key findings and funding opportunities identified in this LRTP	Core team	TBD
Develop data sheets to disseminate to Service units that are currently conducting or preparing for CCPs, including all fisheries to gather additional data	Holm/Hayduk	TBD
Distribution of internal Draft Plan to key internal stakeholders	Core team	At Draft Plan
Host Web-conferences for field staff & management at Draft Plan	Core team	At Draft Plan
Coordinate with Washington Office, Chief of Refuges, Director	Furniss/Caldwell	Ongoing
Brief Region 1 Senior Management	Marxen	Ongoing
External Strategies		
Compile external mailing list	Contractor/Core Team	March 20, 2009
Establish list of external outreach opportunities	Core Team	March 20, 2009
Distribute Planning Update Newsletter 1	Contractor/Core Team	Following internal distribution
Initiate contact with external informed stakeholders to guage interest in additional information about LRTP	Core Team	TBD
Conduct webinar and/or informal presentations to external informed stakeholders about LRTP	Core Team	As needed
Develop and distribute Planning Update 2 - focused on re-authorization and project accomplishments	Contractor/Core Team	TBD
Monitor exchange of information and comments from the public and stakeholders to the LRTP Core Team (review & summarize comments at key milestones)	Contractor	At key milestones
Federal Register Notice announcing public release of draft LRTP	Division of Planning and Visitor Services	At draft LRTP
Summarize all internal and external comments and responses on draft plan development	Contractor/Core Team	Following draft comment period
Document and evaluate public involvement process; develop model for Service regions	Contractor/Core Team	At Final LRTP

Table 3 identifies the key milestones in the LRTP decision-making process at which specific outreach strategies will be designed to seek input from Service staff and external stakeholders.

Table 3
Stakeholder Involvement Strategy by Task

Key Milestones of the Plan	Outreach Strategy
– Vision, Mission, Goals, and Objectives – Purpose and Need – Definition of transportation on Service lands	**Initial Contact** – First Planning Update Newsletter, website development, one-page overview, targeted meetings/contact with internal and external stakeholders to solicit input.
– Existing conditions and trends – Strategies based on Management – Systems/Needs/Other priorities – Performance Measures – Investigation of funding opportunities	**Midway Update** – Update website, targeted meetings with internal and external stakeholders, solicit input.
– Preferred strategy and fiscal constraint – Plan and Summary Report – Process Document	**Final input** – Final Planning Update Newsletter to solicit comments; website update; Seek consensus among key stakeholders.

Appendix G

National Wildlife Refuge Comprehensive Conservation Plan Transportation Planning Guidance

National Wildlife Refuge Comprehensive Conservation Plan Transportation Planning Guidance

Updated February 20, 2008

Transportation Planning Requirements and Guidance

The Refuge Roads Program (RRP) was established in June 1998, when Congress passed the *Transportation Equity Act for the 21st Century* (TEA-21). The passage of the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) in August 2005 reauthorized the RRP and authorized the Alternative Transportation for Parks and Public Lands (ATPPL) program.

Under Title 23 U.S.C. §204(a)(2), the Department of Transportation, in cooperation with the Department of the Interior, is required to develop transportation planning procedures for the Fish and Wildlife Service (Service) that are consistent with the metropolitan and statewide planning processes.

Under Title 49 U.S.C. §5320(e)(1)(A), the Department of Transportation, in cooperation with the Department of the Interior, is required to develop transportation planning procedures for the Service that are consistent with the metropolitan planning provisions, the statewide planning provisions and the public participation requirements.

All transportation projects funded under the RRP must take into consideration the Comprehensive Conservation Plan (CCP), related land use planning (i.e. step-down management plans) and impacts of planning on existing transportation facilities as required by Title 23 U.S.C. §202(e). The whole transportation system should support the mission of the FWS to "conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of present and future generations."

Failure to address/identify/integrate transportation related planning considerations and needs in a station's CCP and step-down management plans would result in the individual refuge or waterfowl production area having to develop a separate transportation plan (i.e. a transportation step-down management plan) before any RRP funding or other transportation program funding can be allocated for transportation related improvements.

Transportation planning is an eligible activity for funding under the Refuge Roads Program. There is a nationwide, interagency indefinite delivery indefinite quantity (IDIQ) contract for architect-engineer services for transportation planning, design and implementation that can be used for transportation planning assistance.

When assistance is needed with transportation planning, the Regional Refuge Roads Coordinator should be contacted. For regional contacts and additional information on refuge roads visit the Service's web site at http://www.fws.gov/refuges/roads/index.html.

The Service's refuge planning policy requires that one of the elements to be considered in the development of a CCP is transportation, including public use roads and trails, pedestrian and cyclist needs, and water and air access as appropriate for each unit of the Refuge System. Transportation issues have always been an inherent part of providing public access and facilitating the Service's priority public uses. The transportation element in the planning requirements helps focus attention on the public safety and access issues associated with the Service's public use programs.

It is important to note that this assessment needs to include the transportation systems within the individual refuge as well as the public access to the refuge. Management and public use changes at a refuge may not only impact the refuge transportation systems but also the local transportation systems that provide access to the refuge. Like wildlife connectivity issues, transportation needs tends to be regional in nature, so transportation planning involves ongoing collaboration and coordination with local and regional stakeholders that manage roads, trails, and transit systems.

The Service must coordinate any proposed transportation system changes and improvements with the respective State, Metropolitan and Rural Planning Organizations to assure that, among other considerations, there will be no negative impacts to congestion or air quality.

Every CCP and step-down management plan related to public use should have clearly identifiable transportation related planning documentation. The transportation planning component of these plans is intended to identify, evaluate and integrate in a comprehensive manner the specific needs, considerations and potential impacts of all transportation alternatives identified by the Service and the public during the planning process. This includes public and administrative roads, multiple use trails, air and water based transportation, pedestrian issues, and public transit all which vary by location and use.

Alternative Transportation Planning

A holistic approach to transportation includes a variety of concepts that should be incorporated into the transportation planning process. Considering 'Alternative Transportation' (including transit, bike, pedestrian, air, and water access) on federally managed lands can help achieve the following goals:

Relieve traffic congestion and parking shortages – Alternative Transportation reduces the number of vehicles needed to transport an equal or greater number of visitors to destinations thereby reducing the need for private vehicle parking spaces.

Enhance visitor mobility and accessibility – Alternative Transportation enhances visitor experience by permitting visitors to enjoy their site experience rather than concentrating on driving or finding scarce parking spaces. Bike access allows visitors to enjoy their surroundings at a slower pace and connect more readily to the resources. Additionally, transit can provide visitors with disabilities improved access to many sites.

Preserve sensitive natural, cultural and historic resources – Alternative Transportation can reduce negative impacts to resources made by private vehicles by reducing the parking footprint, minimizing impacts to wildlife due to traffic, and providing more controlled access to sensitive resources.

Provide improved interpretation, education and visitor information services – At cultural and historical sites, Alternative Transportation can enhance the ability of site personnel to provide interpretive services to present past events in a logical, sequential manner.

Reduce pollution – Air quality could be improved by decreasing the total number of vehicles accessing sites as well as replacing older vehicles with lower emission vehicles. Ambient noise levels can also be reduced with alternative transportation, which improves visitor experience and reduces wildlife disturbance.

Improve economic development opportunities for gateway communities – Alternative Transportation can improve connectivity with surrounding communities, thereby increasing the accessibility of recreational activities. Increasing accessibility through Alternative Transportation can increase the site visitation levels, resulting in additional economic revenues in the local communities through increased use of hotels, restaurants, and other visitor-oriented services.

Alternative Transportation Systems

Alternative Transportation systems can serve both internal trips within and external trips to Federal Lands. In general, at sites where Alternative Transportation is feasible and prudent, needs may be modest and can be served by a small number of vehicles operating on a seasonal basis.

Non-motorized Transportation includes bicycling, walking, hiking, wheelchair use, running, bird-watching, nature interpretation, backpacking, equestrian, non-motorized human-powered snow uses (i.e., skiing, snowshoeing, etc.).

Examples of non-motorized projects include:

- Expand existing bikeways or create new bikeways to increase the opportunity to use a bicycle as a mode of transportation and provide better internal linkages (National Elk Refuge)
- Connect Federal agency trails to the regional trail system and adjacent community trails. (Parker NWR, Neal Smith NWR)
- Build pedestrian paths along tour routes to increase safety and encourage bike/pedestrian use.
- Build hiking trails to encourage non-motorized visitation (Prime Hook NWR)
- Provide bicycle rental program to encourage non-motorized travel

Bus transit systems include a variety of vehicle technologies including tourist trams, vans and van conversions, school buses, small transit buses, historic trolley replicas, standard transit buses, airport apron buses, articulated transit buses, bi-articulated buses, buses with trailers, low floor transit buses, motor coaches, double-decker buses, snow coaches, and electric trolley buses. These vehicles are typically propelled by conventional internal combustion engines (gasoline or diesel) or alternative fuels such as compressed natural gas, bio-diesel, or hybrid electric. Buses can use existing or improved public roads to or within parks/public lands. Most new alternative transportation systems for federally managed public lands will likely be based on buses.

Examples include:

- Develop a guided internal tour route, monitor use to implement changes in tour length, period of operation, seasonality, reservation system. Utilize clean-fuel vehicle, tram, and/or an enclosed, climate-controlled shuttle for the hot summer months. (Rocky Mountain Arsenal NWR, Patuxent NWR, Back Bay NWR)
- In areas of heavy parking congestion, close off access to private vehicles and provide a tour route for visitor access. (Santa Ana NWR)
- Develop an on-demand or regularly scheduled shuttle service from the visitor center or

other large parking lots to and from the major activity areas within the Refuge.

- Establish a peak season, weekend shuttle system that operates on a fixed schedule between a potential parking lot/activity center located in the gateway community and the Federal lands.
- Work with surrounding public transit agencies to extend existing public bus routes to the Federal facilities to enhance public access and to increase access by under-served communities. It would be operated frequently enough to afford an attractive alternative to driving for visitors and residents. (Rocky Mountain Arsenal NWR)
- Develop a transit program for transporting visitors from hotels to tourist events.
- Fixed guideway (rail, light rail, streetcars) systems could be considered in very limited applications where infrastructure is already in place. (Merritt Island rail tour)

Waterborne Transportation should be considered wherever there are areas with limited, if any, access by land, such as on an island, peninsula, or lake. This type of transportation may be particularly useful where major communities are located around the waterways. Types of waterborne transit vehicles include: pontoons and skiffs, mono hull vessels, canoes, kayaks, catamarans and hydrofoils.

Examples include:

- Establish a ferry shuttle to transport visitors between the local area and the Federal lands
- Establish an interpretive boat ride to tour wetland areas.
- Encourage canoe or kayak use by establishing water trails. (Prime Hook NWR)

Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems is a term to describe application of the most current technology to improve communication to the traveling public, a powerful tool in enhancing the visitor experience. Examples include electronic signs relaying real-time information on roadways, such as road conditions, construction information, parking availability, and weather information.

Establishing a 511 telephone number is another way to broadcast information. State Departments of Transportation (DOTs) develop ITS plans that develop both the technology needed as well as the content of messaging. For more information on ITS, go to http://www.fws.gov/refuges/roads/its.html.

Transportation Planning Resources

Transportation Plans help identify transportation needs within Refuges and lay out potential strategies to improve mobility and safety, while protecting resources. As described earlier, the CCP transportation step-down management plan is a tool to comprehensively plan transportation.

Step-down transportation plans should consider Alternative Transportation systems concepts, however, they tend to be high-level and policy oriented. Additional transportation planning will be required to determine the feasibility and operations of these systems. NWR transportation studies are either complete or underway at Ding Darling NWR, White River NWR, Bombay Hook NWR, Chincoteague NWR, Kilauea Point NWR, Ash Meadows NWR, Monomoy NWR, and Ridgefield NWR.

Public Involvement

During the transportation planning process, the Service will provide the public an opportunity to comment on the existing and any proposed changes or improvements to the refuge's public transportation systems and infrastructure. This would include public use roads, parking, land and water trails, transit systems (including ferries, trams, shuttles, buses, etc.) and other applicable forms of land, water and air transportation providing access to or within an individual unit. Also included in this would be any related transportation infrastructure such as visitor information, signage, comfort stations, guard rails, water access points, etc.

In order to facilitate public access to the list of transportation improvements being proposed for funding under the RRP for the current year and subsequent four years, the Service will post a list of projects on the Refuge System web site and the three Federal Highway Administration (FHWA) Federal Lands Highway Divisions web sites.

Additionally, the Service and FHWA will post copies of the most current inventory and condition assessments, and geographic information systems data for public use roads and trails on their respective web servers. This will facilitate the public's ability to access information about the current status and location of the respective trail and road infrastructure.

The comprehensive transportation element (plan) will articulate to the public how access is proposed or provided to a specific station; how transportation facilities support and help facilitate the Service's highest priority of comprehensive resource management and protection; ensures safe public access and improves the visitor experience; and, that compatibility requirements relative to the protected resources will be used to evaluate public use.

NWR Transportation Data

The Service's public use roads and trails on refuges and hatcheries have been identified and mapped by FHWA, as part of the Road Inventory Program (RIP) inventory and condition assessment conducted on behalf of the Service. This information has been provided to all refuges and hatcheries. Copies of specific reports are available for public review upon request. The RIP data for improved roads (paved and gravel) is updated on a five-year cycle.

Planning and Funding Resources

Transportation Guidebooks have been developed for both the National Park Service and Forest Service, link to these documents at http://www.fws.gov/refuges/roads/Transguide.html

Scenic Byways Program information, go to http://www.fws.gov/refuges/roads/byways.html

Refuge Trails information, go to http://www.fws.gov/refuges/roads/trails.html

Transportation Enhancement Programs information, go to http://www.fws.gov/refuges/roads/transEnhancements.html

National Park Service Shuttle Systems: http://www.nps.gov/transportation/tmp/shuttles.htm

Alternative Transportation for Parks and Public Lands Link: http://www.fta.dot.gov/funding/grants/grants_financing_6106.html

Federal transportation programs link: http://www.fws.gov/refuges/roads/links.html

Most comprehensive resource is the refuge roads website: http://www.fws.gov/refuges/roads/index.html

Region 1 CCP Schedule - NW

Refuge/Complex	Lead Planner	GIS Support	Preplanning			Scoping			Alternatives		Internal & Public Review			CCP Finalization					
			Initiate Pre-planning	Pre-planning Report to RO	Pre-planning Approval	FR NOI Published	Scoping Report to RO	Scoping Status Report to WO	Preliminary Draft Alternatives RO Briefing	Alternatives Status Report to WO	Internal Review Draft to RO	Draft CCP FR NOA Published	Draft CCP Public Review Closes	Final CCP Status Report to WO	FONSI Signed	FEIS NOA Published	ROD Signed	FR NOA Final CCP Published	Final Standalone CCP
PLANS UNDERWAY																			
Protection Island	Bardolf	So	Oct 2006	Feb 2007		July 2007		Apr 2008	Jun 2008	Mar 2009	Dec 2009	Mar 2010	Apr 2010	Jul 2010	Sep 2010				Jan 2011
San Juan Island	Bardolf	So	Oct 2006	Feb 2007		July 2007		Apr 2008	Jun 2008	Mar 2009	Dec 2009	Mar 2010	Apr 2010	Jul 2010	Sep 2010				Jan 2011
Ridgefield	Morris	Maty	Jul 2005	Mar 2006		June 2006		Jan 2007	Nov 2008	June 2009	Feb 2010	Mar 2010	May 2010	Aug 2010	Sep 2010				Jan 2011
Julia Butler Hanson	Young	So	Oct 2005	Mar 2006		Sep 2006		Nov 2006	May 2007	June 2007	Mar 2009	2/10/10	3/29/10	Apr 2010		May 2010	Jun 2010		Sep 2010
Lewis & Clark	Young	So	Oct 2005	Mar 2006		Sep 2006		Nov 2006	May 2007	June 2007	Mar 2009	2/10/10	3/29/10	Apr 2010		May 2010	Jun 2010		Sep 2010
Cape Meares	Bardolf	So	Jan 2006	Aug 2006		Sep 2006		Jan 2007	Nov 2007	May 2008	Oct 2008	6/15/09	June 2009	Aug 2009	Sep 2009				Oct 2009
Oregon Islands	Bardolf	So	Jan 2006	Aug 2006		Sep 2006		Jan 2007	Nov 2007	May 2008	Oct 2008	6/15/09	June 2009	Aug 2009	Sep 2009				Oct 2009
Three Arch Rocks	Bardolf	So	Jan 2006	Aug 2006		Sep 2006		Jan 2007	Nov 2007	May 2008	Oct 2008	6/15/09	June 2009	Aug 2009	Sep 2009				Oct 2009
Sheldon	Collins	Drescher	Feb 2006	Apr 2008		5/12/08		Dec 2008	Mar 2009	Nov 2009	Nov 2009	Jan 2010	Mar 2010	Jul 2010		Aug 2010	Sep 2010		Nov 2010
Ankeny	Selvaggio	Cruz	Oct 2006	Oct 2007		2/29/08		May 2008	Nov 2008	Oct 2009	Mar 2010	Jul 2010	Sep 2010	Nov 2010	Dec 2010				Feb 2011
Baskett Slough	Selvaggio	Cruz	Oct 2006	Oct 2007		2/29/08		May 2008	Nov 2008	Oct 2009	Mar 2010	Jul 2010	Sep 2010	Nov 2010	Dec 2010				Feb 2011
William L. Finley	Selvaggio	Cruz	Oct 2006	Oct 2007		2/29/08		May 2008	Nov 2008	Oct 2009	Mar 2010	Jul 2010	Sep 2010	Nov 2010	Dec 2010				Feb 2011
Columbia	Haas	Hayes	Jan 2007	Nov 2008		May 2009		11/23/09	Dec 2009	Jan 2010	Sep 2010	Oct 2010	Dec 2010	Mar 2011	Apr 2011				Jun 2011
Willapa	Young	So	Sep 2007	Mar 2008		4/9/08		June 2008	Apr 2009	May 2009	12/30/09	May 2010	Jun 2010	Oct 2010		Dec 2010	Jan 2011		Mar 2011
Kootenai	Morris	Cruz	Nov 2007	Oct 2008		2/23/09		June 2009	3/04/10	Dec 2009	Apr 2010	Aug 2010	Oct 2010	Dec 2010	Feb 2011				May 2011
Deer Flat	Wing	Maty	Jan 2008	Mar 2009		Jan 2010*		May 2010	Mar 2011	Aug 2011	Jan 2012	Apr 2012	May 2012	Sep 2012	Dec 2012				Mar 2013
Minidoka	Morris	Maty	Jan 2008	Dec 2008		Jan 2010*		May 2010	Mar 2011	Aug 2011	Jan 2012	Apr 2012	May 2012	Sep 2012	Dec 2012				Mar 2013
			*Waiting for SOL feedback on DRF and MND and meetings with BOR, IDFG, and State Lands before proceeding with scoping; after new PL EODs for DRF																
PRE-PLANNING BEGINNING IN FY09																			
Malheur	Selvaggio	Stockenberg	Jan 2009	Jan 2010		6/29/09	Jan 2010	Mar 2010	Aug 2010	Sep 2010	Feb 2011	May 2011	July 2011	Dec 2011		Apr 2012	Jun 2012		Jul 2012
Cold Springs	Haas	Hayes	Apr 2009	Mar 2010		Apr 2010		Sep 2010	Feb 2011	Apr 2011	July 2011	Oct 2011	Nov 2011	Feb 2012	Apr 2012				June 2012
McKay Creek	Haas	Hayes	Apr 2009	Mar 2010		Apr 2010		Sep 2010	Feb 2011	Apr 2011	July 2011	Oct 2011	Nov 2011	Feb 2012	Apr 2012				June 2012
Bear Lake	Morris	Stockenberg	May 2009	Mar 2010		Apr 2010		June 2010	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Dec 2012				Mar 2013
Oxford Slough	Morris	Stockenberg	May 2009	Mar 2010		Apr 2010		June 2010	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Dec 2012				Mar 2013
Camas	Morris	Stockenberg	May 2009	Mar 2010		Apr 2010		June 2010	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Dec 2012				Mar 2013
Grays Lake	Smith	Stockenberg	Jan 2009	Jun 2009		Apr 2010		June 2010	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Dec 2012				Mar 2013
Conboy Lake	Haas	Hayes	July 2009	Mar 2010		Sep 2010		Jan 2011	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Nov 2012				Dec 2012
Toppenish	Haas	Hayes	July 2009	Mar 2010		Sep 2010		Jan 2011	Apr 2011	May 2011	Sep 2011	Jan 2012	Mar 2012	Sep 2012	Nov 2012				Dec 2012
PRE-PLANNING BEGINNING IN FY10																			
Tualatin River	McCarthy	So	Oct 2009	Mar 2010		Jun 2010		Dec 2010	May 2011	Jun 2011	Aug 2011	Mar 2012	May 2012	Sep 2012	Dec 2012				Mar 2013
Black River (Nisqually)	Young	So	Jan 2010	May 2010		Nov 2010		Apr 2011	Oct 2011	Dec 2011	Feb 2012	May 2012	Jun 2012	Sep 2012	Dec 2012				Mar 2013
Grays Harbor	Young	So	Jan 2010	May 2010		Nov 2010		Apr 2011	Oct 2011	Dec 2011	Feb 2012	May 2012	Jun 2012	Sep 2012	Dec 2012				Mar 2013
Bandon Marsh	Bardolf	So	Nov 2009	Jun 2010		Oct 2010		Feb 2011	Jul 2011	Sep 2011	Jan 2012	Apr 2012	May 2012	Aug 2012	Nov 2012				Feb 2013
Nestucca Bay	Bardolf	So	Nov 2009	Jun 2010		Oct 2010		Feb 2011	Jul 2011	Sep 2011	Jan 2012	Apr 2012	May 2012	Aug 2012	Nov 2012				Feb 2013
Siletz Bay	Bardolf	So	Nov 2009	Jun 2010		Oct 2010		Feb 2011	Jul 2011	Sep 2011	Jan 2012	Apr 2012	May 2012	Aug 2012	Nov 2012				Feb 2013
Dungeness	Bardolf	So	Mar 2010	Sep 2010		Dec 2010		Apr 2011	Jun 2011	Aug 2011	Nov 2011	Mar 2012	Apr 2012	Jul 2012	Oct 2012				Jan 2013

Color key — Complete; Past due(?); Due in the next 3 months; Dates need review

Region 1 CCP Milestones
Hawaii/Pacific Islands

Refuge/Complex	Preplanning				Scoping			Alternatives			Internal & Public Review			CCP Finalization			
	Lead Planner	Initiate Preplanning	Preplanning Report to RO	Preplanning Approval	FR NOI Published	Scoping Report to RO	Scoping Status Report to WO	Preliminary Alternatives RO Briefing	Alternatives Status Report to RO	Alternatives Status Report to WO	Internal Review Draft to RO	Draft CCP FR NOA Published	Draft CCP Public Review Closes	Final CCP Status Report to WO	FONSI Signed	FR NOA Final CCP Published	Final Standalone CCP
Guam	Perry	July 2006	Mar 2007		Jul 2007		Oct 2007	Oct 2008		Dec 2008		7/22/09	Jul 2009	Sep 2009	Sep 2009	Dec 2009	
Kealia Pond	Beauregard	Sept 2006	May 2009		10/20/09		12/16/09	Jan 2010		Feb 2010	Apr 2010	Jun 2010	Jul 2010	Sep 2010	Sep 2010	Oct 2010	
Kakahaia	Beauregard	Sept 2006	May 2009		10/20/09		12/16/09	Jan 2010		Feb 2010	Apr 2010	Jun 2010	Jul 2010	Sep 2010	Sep 2010	Oct 2010	
J. Campbell	Beauregard	Jan 2007	Jun 2008		12/1/08		May 2009	Oct 2009		Nov 2009	Jan 2010	Mar 2010	Apr 2010	Jun 2010	Jun 2010	Aug 2010	
Pearl Harbor	Beauregard	Jan 2007	Jun 2008		12/1/08		May 2009	Oct 2009		Nov 2009	Jan 2010	Mar 2010	Apr 2010	Jun 2010	Jun 2010	Aug 2010	
Hakalau Forest	Perry	Oct 2007	Oct 2008		2/25/09		Apr 2009	Oct 2009	1/11/10	1/14/10	Dec 2009	Mar 2010	Apr 2010	May 2010	May 2010	Aug 2010	
Huleia	Perry	Oct 2007	June 2009		9/28/09		Jan 2010	Mar 2010		May 2010	Aug 2010	Nov 2010	Jan 2011	May 2011	May 2011	Aug 2011	
Hanalei	Perry	Oct 2007	June 2009		9/28/09		Jan 2010	Mar 2010		May 2010	Aug 2010	Nov 2010	Jan 2011	May 2011	May 2011	Aug 2011	
Kilauea Point	Perry	Oct 2007	June 2009		9/28/09		Jan 2010	Mar 2010		May 2010	Aug 2010	Nov 2010	Jan 2011	May 2011	May 2011	Aug 2011	
PRE-PLANNING BEGINNING IN FY09																	
Rose Atoll NWR/MNM	Perry	Apr 2009	n/a*		11/9/09		Dec 2009	Feb 2010		Mar 2010	May 2010	Aug 2010	Sep 2010	Dec 2010	Dec 2010	Jan 2011	
Palmyra Atoll	Beauregard	Aug 2009	n/a*		Dec 2009		Apr 2010	May 2010		Jun 2010	Aug 2010	Nov 2010	Dec 2010	Mar 2011	Mar 2011	Apr 2011	
Kingman Reef	Beauregard	Aug 2009	n/a*		Dec 2009		Apr 2010	May 2010		Jun 2010	Aug 2010	Nov 2010	Dec 2010	Mar 2011	Mar 2011	Apr 2011	
PRE-PLANNING BEGINNING IN FY10																	
Pacific Remote Islands MNM**	Beauregard	Aug 2009	n/a*		Dec 2009		Apr 2010	Jun 2010		Aug 2010	Sep 2010						
Johnston Atoll	Beauregard	Aug 2009	n/a*		Dec 2009		Apr 2010	Jun 2010		Aug 2010	Sep 2010						
Wake Atoll	Beauregard	Aug 2009	n/a*		Dec 2009		Apr 2010	Jun 2010		Aug 2010	Sep 2010						
Marianas Trench MNM	Perry	Jan 2010	n/a**		Jan 2010		Feb 2010	Apr 2010		May 2010	July 2010						
Mariana Arc of Fire	Perry	Jan 2010	n/a**		Jan 2010		Feb 2010	Apr 2010		May 2010	July 2010	Oct 2010	Oct 2010	Dec 2010	Dec 2010	Jan 2011	
Mariana Trench	Perry	Jan 2010	n/a**		Jan 2010		Feb 2010	Apr 2010		May 2010	July 2010	Oct 2010	Oct 2010	Dec 2010	Dec 2010	Jan 2011	
PRE-PLANNING BEGINNING IN FY11																	
Oahu Forest	TBD	Jan 2011	Aug 2012		Oct 2012		Jan 2013	July 2013		Aug 2013	Nov 2013	Apr 2014	July 2014	Oct 2014	Oct 2014	Jan 2015	
Guam Overlay	Perry	TBD															

Color key — Complete; Past due(?); Due in the next 3 months; Dates need review

* To streamline the process and facilitate completion of CCP/MMPs by January 2011 as required by proclamation, proposed skipping preplanning report and going directly to preplan with alternatives.

** Pre-planning Report due with Scoping Report

Appendix H

Contact Information for Non-Service Planning Organizations

Transportation Planning Organizations

Planning Level	State	Organization Name	Contact Name, Position	Address	E-mail	Phone
Department of Transportation Regions	HI	Hawaii	Glenn M. Yasui Highways Administrator	869 Punchbowl Street, Room 513 Honolulu, HI 96813		808-587-2220
		Kauai	Ray McCormick District Engineer	1720 Haleukana Street Lihue, HI 96766		808-241-3000
		Maui	Ferdinand Cajigal Engineering Program Manager	650 Palapala Drive Kahului, HI 96732		808-873-3538
		Oahu	Pratt Kinimaka Engineering Program Manager	727 Kakoi Street Honolulu, HI 96819		808-831-6703
	ID	ITD 1	Damon Allen District Engineer	600 W. Prairie Coeur d´Alene, ID 83815-8764		208-772-1201
		ITD 2	James F. Carpenter District Engineer	2600 Frontage Road, P.O. Box 837 Lewiston 83501-0837		208-799-5090
		ITD 3	Dave Jones District Engineer	8150 Chinden Boulevard P.O. Box 8028 Boise, ID 83707-2028		208-334-8300
		ITD 4	Devin O. Rigby District Engineer	216 South Date Street Shoshone, ID 83352-0820		208-886-7800
		ITD 5	Ed Bala District Engineer	5151 South 5th, P.O. Box 4700 Pocatello, ID 83205-4700		208-239-3300
		ITD 6	Blake Rindlisbacher District Engineer	206 North Yellowstone Highway, P.O. Box 97 Rigby, ID 83442-0097		208-745-7781
	OR	Central Oregon	Gary Farnsworth Area Manager	63020 OB Riley Road Bend, OR 97701	Gary.C.Farnsworth@odot.state.or.us	541-388-6071
		DOT Regions	Doug Tindall Deputy Director	355 Capitol St. NE, Rm. 135 Salem, OR 97301-3871		503-986-3435
		Eastern Oregon	Tom Davis	3012 Island Ave. La Grande, OR 97850-9497	Thomas.J.Davis@odot.state.or.us	541-889-9115 ext. 224
		Northwest	David Kim Area Manager Metro Central	123 NW Flanders St. Portland, OR 97209		503-731-4998
		Portland Metro	Susan D. Keil Director	1120 SW Fifth Ave, Rm 800 Portland, OR 97204	Director@pdxtrans.org	503-823-5185
		South Central	Norman C. “Butch” Hansen South Central Oregon Area Manager	2557 Altamont Drive Klamath Falls, OR 97603-5701	norman.c.hansen@odot.state.or.us	541-883-5662

Planning Level	State	Organization Name	Contact Name, Position	Address	E-mail	Phone
Department of Transportation Regions	OR	Southwest	Mark Usselman South West Oregon Area Manager		mark.ussleman@odot.state.or.us	541-396-3707
		Willamette Valley & Coast	Tim Potter Area Manager	885 Airport Road SE, Bldg P Salem, OR 97301-4788	James.T.Potter@odot.state.or.us	503-986-2900
	WA	North Central	Dan Sarles Acting Region Administrator and Assistant Region Administrator for Engineering	1551 N. Wenatchee Ave. Wenatchee, WA 98807	SarlesD@wsdot.wa.gov	509-667-3000
		Olympic	Kevin Dayton Region Administrator	P.O. Box 47440 Olympia, WA 98504-7440	daytonk@wsdot.wa.gov	360-357-2600
Metropolitan Planning Organizations	HI	Oahu MPO	Brian Gibson Executive Director, Oahu MPO	707 Richards Street, Suite 200 Honolulu, HI 96813	OahuMPO@OahuMPO.org	808-587-2015
	ID	COMPASS	Matt Stoll Executive Director	800 S. Industry Way, Suite 100 Meridian, ID 83642	mstoll@compassidaho.org	208-855-2558 ext. 241
	WA	Benton-Franklin COG	Gwen Luper Executive Director	P.O. Box 217 Richland, WA 99352-0217	gluper@bfcog.us	509-943-9185
		SW WA RTC	Dean Lookingbill Transportation Director	P.O. Box 1366 Vancouver, WA 98666-1366	dean.lookingbill@rtc.wa.gov	360-397-6067
		Thurston MPO	Lon Wyrick Executive Director	2424 Heritage Court SW, Suite A. Olympia, WA 98502	wyrickl@trpc.com	360-956-7575
		Yakima Valley COG	Page Scott Executive Director	311 North 4th Street, Suite 202 Yakima, WA 98901	scottp@yvcog.org	509-574-1550
Regional Planning District	OR	Cascades West ACT	Linda Modreel ACT Chair	408 SW Monroe Ave., Suite 111 Corvallis, OR 97333	linda.l.modrell@co.benton.or.us	541-766-6800
		Lower John Day ACT	Judge Gary Thompson ACT Chair	500 Court Street P.O. Box 365 Moro, OR 97039	gthompson@co.sherman.or.us	541-565-3312
		Northeast ACT	Commissioner Fred Warner ACT Chair	3012 Island Avenue La Grande, OR 97850-9497	fwarner@bakercounty.org	541-523-8200
		Northwest Oregon ACT	Shirley Kalkhoven ACT Chair	P.O. Box 928 Salem, OR 97308	shirleyk@nehalemtel.net	503-368-6770
		South Central ACT	Brad Winters ACT Chair	513 Center Street Lakeview, OR 97630	bwinters@co.lake.or.us	541-947-6005
		Southeast ACT	Steve Grasty ACT Chair	450 N. Buena Vista, P.O. Box 699 Burns, OR 97720		541-573-6356

Planning Level	State	Organization Name	Contact Name, Position	Address	E-mail	Phone
Regional Planning District	WA	Benton-Franklin-Walla Walla RTPO	Gwen Luper Executive Director	P.O. Box 217 Richland WA 99352-0217	gluper@bfcog.us	509-943-9185
		North Central RTPO	Jeff Wilkens Executive Director	300 South Columbia Street 3rd Floor Wenatchee, WA 98801-6144	jeff@wvtc.org	509.663.9059 ext. 228
		Northeast WA RTPO	Leslie Jones Executive Director	347 W. 2nd, Suite A Colville, WA 99114-2300	ljones@teddonline.com	509-684-4571
		Palouse RTPO	Duane Wollmuth Executive Director	845 Port Way Clarkston, WA 99403	duane@seweda.org	509-751-9144
		Peninsula RTPO	Kevin Dayton Region Administrator	P.O. Box 47440 Olympia, WA 98504-7440	daytonk@wsdot.wa.gov	360-357-2600
		Puget Sound RC	Rick Olson Director, Government Relations & Communications	1011 Western Avenue, Suite 500 Seattle, WA 98104-1035	rolson@psrc.org	206-971-3050
		Quad-County RTPO	Derek Pohle Director of Public Works	124 Enterprise Street S.E. Ephrata, WA 98823	dpohle@co.grant.wa.us	509-754-6082
		Spokane RTC	Glenn Miles Transportation Manager	221 W. First Avenue, Suite 310 Spokane, WA 99201-3645	gmiles@srtc.org	509-343-6370
		SW WA RTC	Dean Lookingbill Transportation Director	P.O. Box 1366 Vancouver, WA 98666-1366	dean.lookingbill@rtc.wa.gov	360-397-6067 ext. 5208
		SW WA RTPO	Steve Harvey Director	207 4th Avenue N., Administration Annex Kelso, WA 98626-4195	steveharvey@cwcog.org	360-577-3041

MPO = Metropolitan Planning Office
RTPO = Regional Transportation Office
RTC = Regional Transportation Council
RC = Regional Council
ACT = Area Commissions on Transportation

Appendix I

Alternative Transportation Priorities and Strategies

Summary

Alternative transportation systems (ATS) are an important component of transportation to and within refuges and hatcheries in Region 1. This section provides background on the definition and benefits of ATS and summarizes the findings of the Regional Alternative Transportation Evaluation and the Region 1 ATS Questionnaire, with implications and recommendations for Region 1.

Key Needs

The stations in Table 1 were identified as having the most critical needs or the greatest potential for ATS (see Table 3 for information on prioritization). A complete listing of other stations with longer-term potential for ATS is included later in this appendix.

Table 1: High Priority ATS Needs by Station

	Refuge	Transit Distance	Trail Distance Quality	Priority
1	Steigerwald Lake NWR *Washougal, WA*	Less than ½ mile	Direct connection	High
	– Extend C-TRAN bus service to refuge entrance, or provide safe pedestrian passage from the current bus stop to refuge entrance. – Promote existing non-motorized access via the Columbia River Dike Trail.			
2	Kealia Pond NWR *Kihei, HI*	1-3 miles	Less than ½ mile	High
	– Work with Maui Bus to provide a new bus stop near the refuge entrance between Kihei and Maalaea. – Promote existing non-motorized access via the Mokulele Highway bike path.			
3	Ridgefield NWR *Ridgefield, WA*	More than 3 miles	1-3 miles	High
	– Provide a non-motorized trail to downtown Ridgefield and link with existing sidewalks. – Promote and expand the use of transit for Bird Fest and other special events.			
4	Tualatin NWR *Sherwood, OR*	Less than ½ mile	Direct connection (future)	High
	– Promote the use of existing Tri-Met bus service for connections to bicycle and light rail networks. – Support and promote the use of trail connections via Metro's Toquin and the City of Sherwood's trail systems.			
5	Kauai NWRC/Kilauea Point NWR *Kilauea, HI*	½ - 1 mile	½ - 1 mile	High
	– Provide a shuttle to connect Kilauea Point NWR to Kauai Bus service or to the town of Kilauea. – Enhance opportunities for bicycle and pedestrian access.			
6	Nisqually NWR *Olympia, WA*	2 miles	More than 3 miles	High
	– Work with Intercity Transit to extend bus service between the refuge and the Olympia region.			

Recommendations

The recommendations in Table 2 may assist Region 1 in enhancing the use of alternative transportation, as specified under the Sustainability goal.

Table 2: ATS Recommendations

	Action Item	Description
1	Increase non-motorized connections	– Target stations with the greatest potential for new or improved non-motorized infrastructure, as identified in the ATS Questionnaire, for targeted technical assistance. – Encourage stations to apply for Paul S. Sarbanes Transit in Parks (TRIP) grants to fund new infrastructure projects. – Identify MPOs and rural planning agencies that have stations within their boundaries and facilitate participation of FWS staff in their long-range planning efforts. – Include non-motorized access as a component of CCPs, step-down plans, and site design for new facilities.
2	Utilize public or private transit use for festivals and special events	– Identify stations with high visitation special events. – Create a best-practices resource or contact manual for stations that currently use transit for special events. – Identify contracting mechanisms to facilitate short-term rentals of transit vehicles for use at events.
3	Enhance connections to local bus routes for urban and suburban stations within transit service areas	– Encourage stations to apply for TRIP grants to conduct planning or feasibility studies for transit access. – Encourage stations to contact the TRIP Technical Assistance Center (TAC) for technical assistance on ATS planning.1 – Identify transit providers with service areas coinciding with station locations (with the assistance of MPOs and State DOTs) and encourage partnerships between providers and station staff.
4	Improve and strengthen partnerships to improve ATS connections and leverage funding	– Encourage stations to partner with local governments, transportation planners, transit providers, friends groups, and others to craft appropriate strategies for transportation and visitor management. – Identify timelines for major regional long-range transportation plans (LRTP), transit plans, and bicycle and pedestrian plans to improve FWS participation in the development of the plan. – Partner with local governments and other Federal agencies to apply for grants to fund ATS projects.

ATS Background

As visitation among Region 1 stations grows, ATS will become an increasingly important way to manage visitors sustainably while protecting wildlife. Given the locations and missions of most Region 1 stations, many station staff have not considered the applicability of ATS to their stations' plans and programs. Increasing awareness of ATS and its benefits should be a priority for Region 1; this section offers several insights and strategies for ATS solutions that may be successful in Region 1.

Definition of ATS

- ATS include any travel by means other than personal automobile, such as:
- Motorized transportation systems operating internally within stations
- Shuttles and van transit connecting stations with other destinations
- Regional transit connections (bus, light rail, trolley, commuter rail, passenger rail)
- Bicycle and pedestrian infrastructure (sidewalks, paths, bicycle lanes, regional trails)
- Water-based transportation
- Publicly and privately operated transit systems

Relationship to LRTP Goals

ATS complements several goals of the LRTP, most notably Sustainability but also Natural Resource Protection and Welcome and Orient Visitors. The use of transit, non-motorized, and water-based modes supports the LRTP goals, with the following illustrative examples:

- **Sustainability:** The reduction of personal automobiles in accessing and traveling through stations, both for visitors and staff, can bring about several benefits that reinforce sustainable transportation practices. ATS can reduce the Service's carbon footprint, reduce the use of carbon-based fuels, enhance accessibility, and reduce air pollutants emitted from vehicles.
- **Natural Resource Protection:** By reducing the use of personal automobiles, FWS can also reduce the impacts that these vehicles have upon natural resources. Vehicular resource impacts include wildlife collisions, invasive species, noise pollution, particulate emissions, erosion, and pollutants that can enter the soil or water. Over the long term, increasing ATS for stations with increasing visitation can minimize the need for new roads or parking, thus preserving more area for wildlife habitat.
- **Welcome and Orient Visitors:** ATS can be a critical visitor management tool for station staff facing increasing visitor demands and limited resources and capacity. The use of transit can enhance visitors' understanding of the station's natural resources by facilitating interpretive tours or directing visitors for special events. Signage and orientation information directed at non-automobile modes can also help integrate these modes most appropriately into station transportation. Also, by including refuges and hatcheries on existing non-motorized and transit maps and signage, FWS can welcome visitors to its stations within the context of the broader region.

Trends and Strategies

The Region's refuges and hatcheries are diverse in their visitation and associated travel patterns, but a few trends emerge that inform ATS needs and planning:

Refuges and hatcheries near major urban areas and along the I-5 corridor attract (or have the potential to attract) high visitation from urban and suburban residents, and they often have visitor amenities such as hiking trails, auto tour routes, education programs, and wildlife art to serve those visitors.

1. Several stations outside of population centers contain special resources that attract high visitation, making these "destination stations." Almost all visitors must travel to these stations by personal vehicle.
2. Many stations across the region have special events and festivals with significant spikes in visitation that necessitate temporary visitor management and transportation strategies.
3. Many stations host local and regional school groups for field trips to their natural and cultural resources; a few stations have facilities that can specifically accommodate these groups.
4. The majority of Region 1 stations are outside of the service district of public transit providers.
5. Many of the gateway communities near stations have extensive existing non-motorized infrastructure and residents that frequently bicycle for transportation and recreational purposes.
6. Demographic trends may lead to more elderly residents in the region, including more people who do not or cannot drive. Other regional trends may include smaller vehicles, electric vehicles, and affordability of transportation.

Based on these trends and station characteristics, and informed by the responses from the ATS Questionnaire, the following types of ATS may be most beneficial to Region 1:

1. Non-motorized paths, bicycle lanes, bicycle racks, and signage for non-motorized users to connect stations with existing non-motorized trail networks, gateway towns, and local and regional amenities. In most cases, encourage bicycle use to but not within stations to avoid conflicts between bicycles and wildlife.
2. Transit use for festivals and special events
3. Connections to local bus routes for urban and suburban stations within transit service areas
4. Partnerships with local groups to craft appropriate strategies for transportation and visitor management

Regional Alternative Transportation Evaluation

The FWS and the U.S. Department of Transportation Volpe Center (Volpe Center) conducted a regional alternative transportation evaluation (RATE) in Region 1 to ensure effective integration of alternative transportation systems into the Region 1 LRTP. The Region 1 RATE was also meant to serve as a pilot for the integration of ATS into the National FWS LRTP. Staff from the Volpe Center, FWS Region 1, and Western Federal Lands Highways came together in Portland, Oregon, in October 2010, to discuss alternative transportation needs and constraints in the region and to develop the ATS Questionnaire. Volpe Center staff also visited Ridgefield NWR, Steigerwald Lake NWR, the Mid-Columbia Refuge Complex, and the Spring Creek National Fish Hatchery to identify specific opportunities for ATS in these and other stations. The RATE also provided lessons on how ATS may be instituted more broadly across Region 1.

Based on the station visits and strategic discussions, the following are key findings and outcomes from the RATE:

- The RATE team developed and refined the ATS Questionnaire, which was circulated among all stations in Region 1.
- Many stations already use transit for festivals, working closely with community and regional partners and transit providers to rent vehicles.
- Some stations aiming to increase their visitation and interpretive services found potential for ATS as a tool to help achieve this goal. Other stations expressed reluctance to pursue ATS based on limited staffing to manage existing (or growing) visitation.

Some of the opportunities identified for specific ATS integration into stations include:

- Pedestrian facilities partially cover the distance between the Town of Ridgefield and the Ridgefield NWR's new visitor center. There is an opportunity to create a non-motorized trail to complete the connection.
- A C-TRAN bus stop is located approximately a half mile from the Steigerwald Lake NWR entrance, and C-TRAN (the transit provider in Clark County, WA) offers frequent service to the Washougal/Camas area. Currently, no pedestrian facilities connect the bus stop with the refuge.
- A U-shaped trail connected to the new McNary NWR education center begins and terminates at Lake Road, and pedestrian facilities connecting the trailheads would allow for enhanced visitor experience and safety. A major highway construction project in the region is expected to increase traffic on Lake Road. A safe, off-road pedestrian connection along Lake Road would encourage heavier trail use.
- The Columbia River Heritage Trail, a multi-use, paved trail, runs through the Umatilla NWR and connects to nearby towns.
- Annual festivals, including Ridgefield NWR's Bird Fest and Columbia NWR's Sand Hill Crane Festival, attract thousands of visitors. These events already incorporate ATS for parking shuttles and interpretive tours, and they can be models for other stations.

ATS Questionnaire

The ATS Questionnaire is a tool to identify the broad and specific needs and opportunities for ATS in Region 1, as well as to target areas for future technical assistance from the Regional and Federal levels. Staff from the Volpe Center, FWS Region 1, FWS Headquarters, and Western Federal Lands Highways developed the Questionnaire in conjunction with the RATE with feedback from station staff participating in the RATE. The Questionnaire was available to stations as an online survey. A copy of the questionnaire appears at the end of this appendix, but the circulated version appeared as an online survey format only. Region 1 staff circulated a link to the online ATS Questionnaire via email to all 105 stations in the region, with responses collected between November 15 and December 3, 2010. Twenty-four stations responded to the questionnaire, and the responses from these stations are aggregated and analyzed within this section.

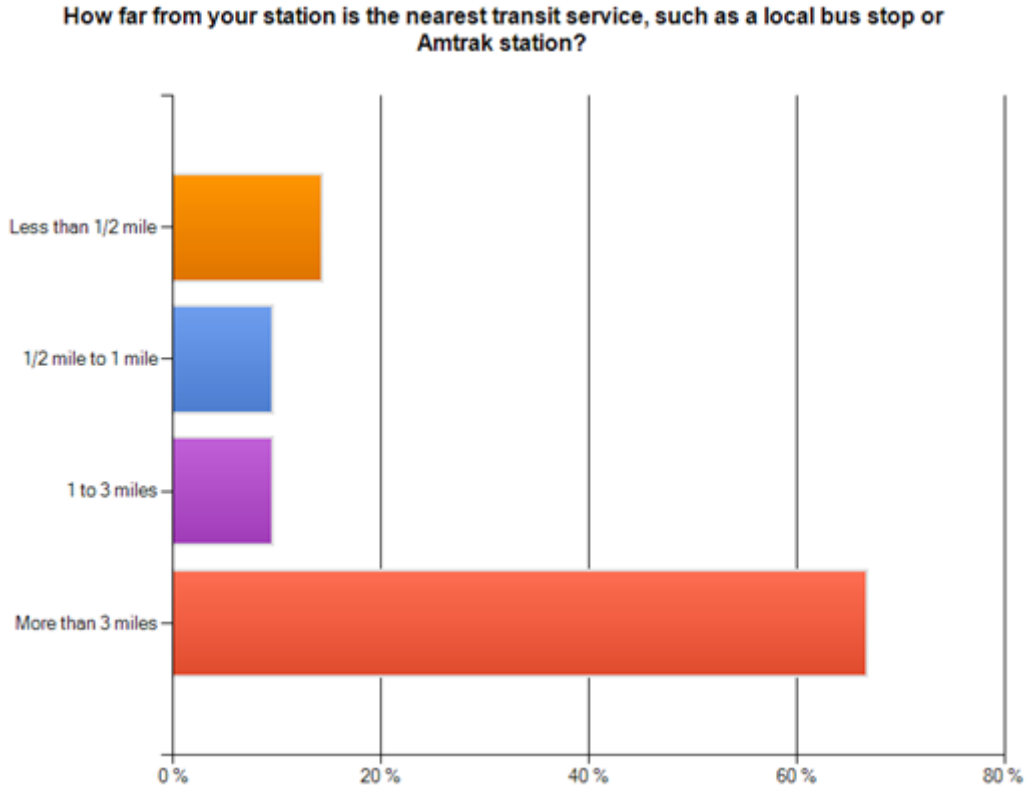
Opportunities for Transit

Many stations are located outside of major metropolitan areas and do not think of transit as a means of visitor access. However, even in non-urban areas, rural transit providers and inter-city transit (including bus and rail) may offer transit services that can be extended to visitor access. Furthermore, many urban refuges are already within a few miles of existing transit service and can capitalize on this mode for station access. As shown in Figure 1, 33 percent of questionnaire respondents had a bus stop or train station within three miles of their station, and approximately 30 percent of respondents also answered that transit might be able to assist their station for both general visitor access and for special events. Also, nearly all stations (95%) with a public use component reported that school groups and friends groups use buses or vans to transport groups to the station.

Transit use for special events, which is already occurring throughout the region, may be the greatest short-term opportunity for transit. Sixty-five percent of respondents have at least one special event with high visitation. Types of events include festivals centered around wildlife (bird festivals, salmon festivals, etc.), fishing events, open houses, children's activity days, and miscellaneous events. More than half of respondents have events in the spring, with many events also occurring in the fall and a small number in the summer and winter. The seasonality of events suggests that stations may be best served by short-term rentals or contracts with public or private transit providers. Daily visitation at these festivals generally ranges from 150 to 1,800, with an average of 550 daily visitors. However, the Wenatchee River Salmon Fest hosted by the Leavenworth National Fish Hatchery, in late September attracts 10,000 visitors. Stations currently use overflow lots on-site to manage heavy visitation for events, but some stations, including Columbia NWR and Nisqually NWR, rent vans and buses to shuttle visitors between the refuge, parking lots, and other event sites. Ridgefield NWR also hires charter buses to offer birding tours on its auto route; the refuge does not allow private vehicles along this route during Bird Fest and they have received positive feedback for this program.

Internal transit does not play a major role in Region 1, due to the relatively low levels of visitation and congestion on internal station roads. However, internal transit may have a future role for some stations with high visitation, particularly for "destination" stations such as Kealia Pond NWR and Kauai NWR in Hawaii.

Figure 1: Distance to Transit

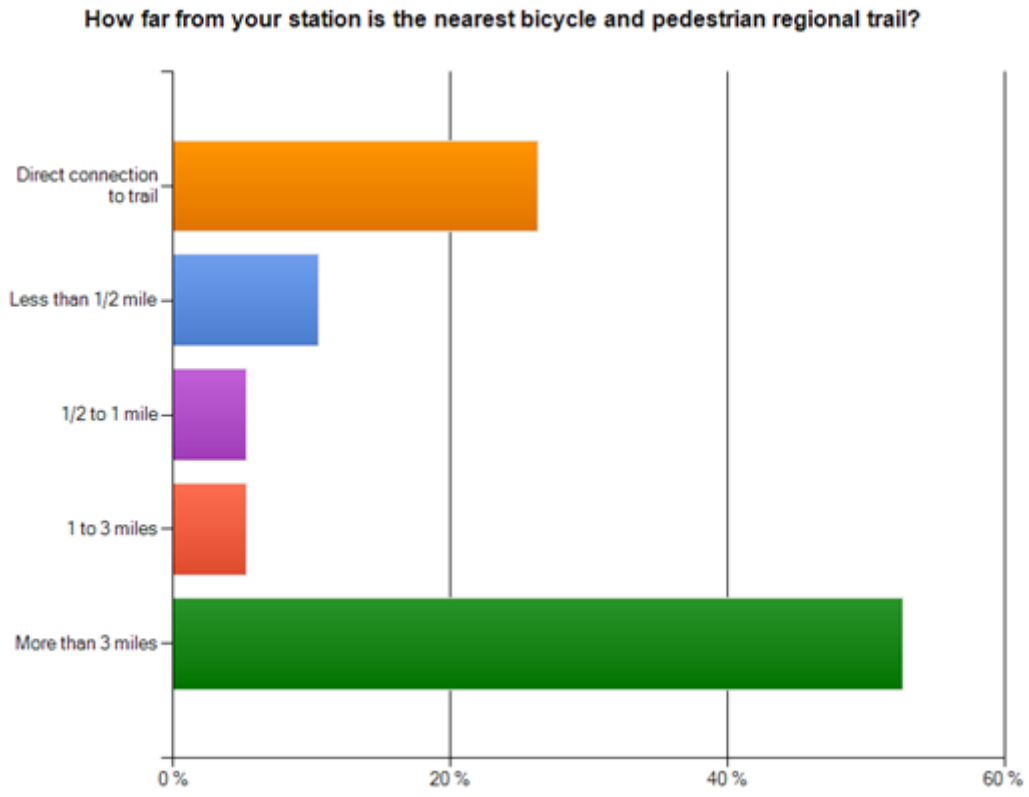


Opportunities for Trails

Bicycle and pedestrian access is viable for many of the region's refuges and hatcheries, both rural and urban. Urban stations can connect into metropolitan non-motorized networks of paved trails and bicycle lanes, while rural stations can seek specific connections locally to gateway towns and regional destinations. Many rural and small urban counties also have bicycle and pedestrian trails or trail plans.

The majority (53 percent) of stations responding to the questionnaire has a regional non-motorized trail within three miles, and 26 percent have a trail with a direct connection to the station, as seen in Figure 2.

Figure 2: Distance to Trails



Questionnaire respondents also called for more non-motorized connections as a means to enhance their visitor program. As shown in Figure 3, 55 percent of respondents would like new bicycle paths for access to their station, 35 percent would like new pedestrian paths for access to their station, and 25 percent would like new pedestrian paths within their station. Other opportunities for enhancing visitor programs at stations include new transit service and promotion and marketing.

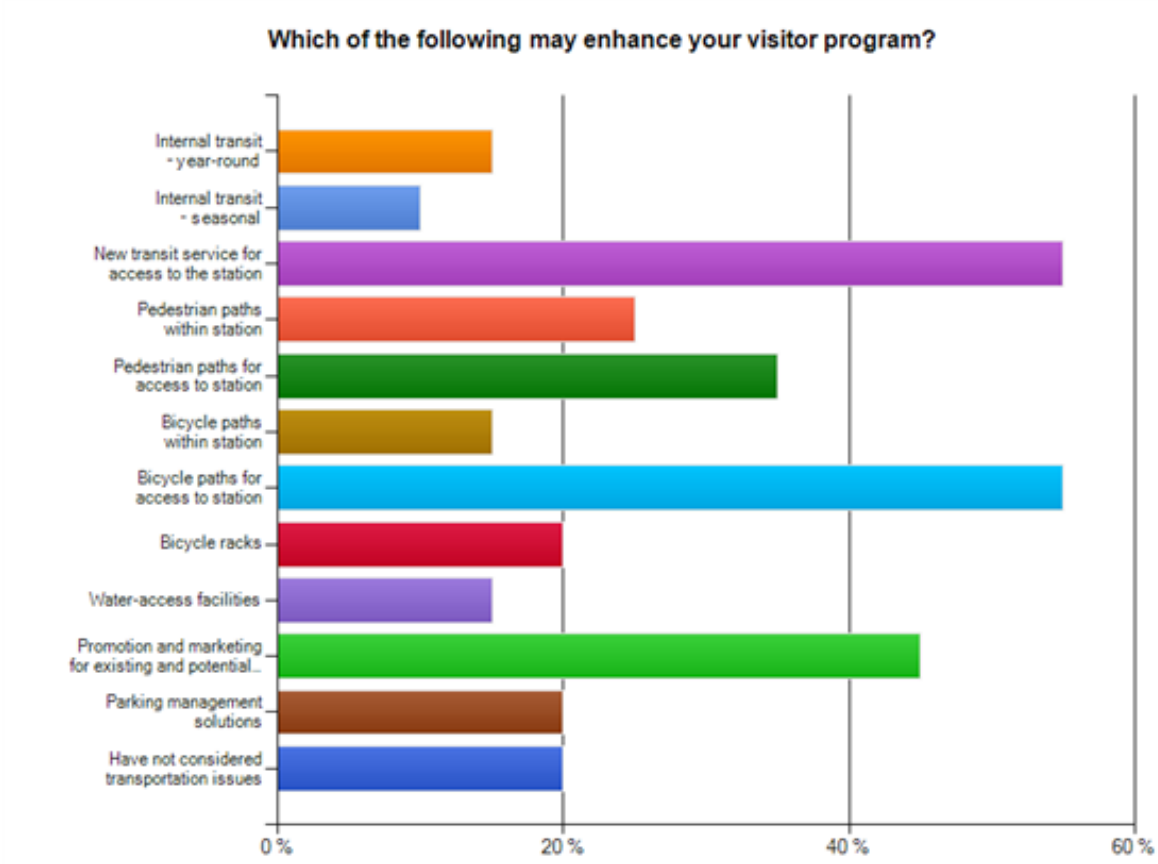
Visitor Characteristics

Among questionnaire respondents, the most popular visitor activity was wildlife observation, closely followed by environmental education, photography, and interpretation. These activities can be conducive to transit; refuges in Region 1 and in other regions have successfully used vans or buses for environmental education programs or to promote wildlife observation. For many refuges, a significant number of visitors also hunt and fish. Both of these activities require special equipment that may be challenging to bring to the station using ATS. However, refuges may consider transit use, outfitted with special storage capabilities, for seasonal hunting events. Refuges can also provide water-based access opportunities, such as connections to regional canoe and kayak trails or dock infrastructure, to visitors who enjoy fishing and wish to access the refuge or travel within the refuge by boat.

Questionnaire respondents indicated that overall station visitation is likely to grow in the coming years. Seventy-one percent of respondents expect visitation at their stations to increase, and the remaining 29

percent expect visitation to remain the same. No respondents anticipate decreasing visitation. A slight majority of respondents (52 percent) are actively trying to increase visitation, while the rest of respondents are not actively trying to increase or decrease visitation. Anecdotally, some stations expressed concern with staff and station capacity to handle increasing visitation. Of the questionnaire respondents, 19 percent noted that they share a high level of concern with managing transportation for future visitors. Thirty-eight percent felt this issue may be a future concern, and 43 percent expressed little or no concern.

Figure 3: Visitor Program Enhancements



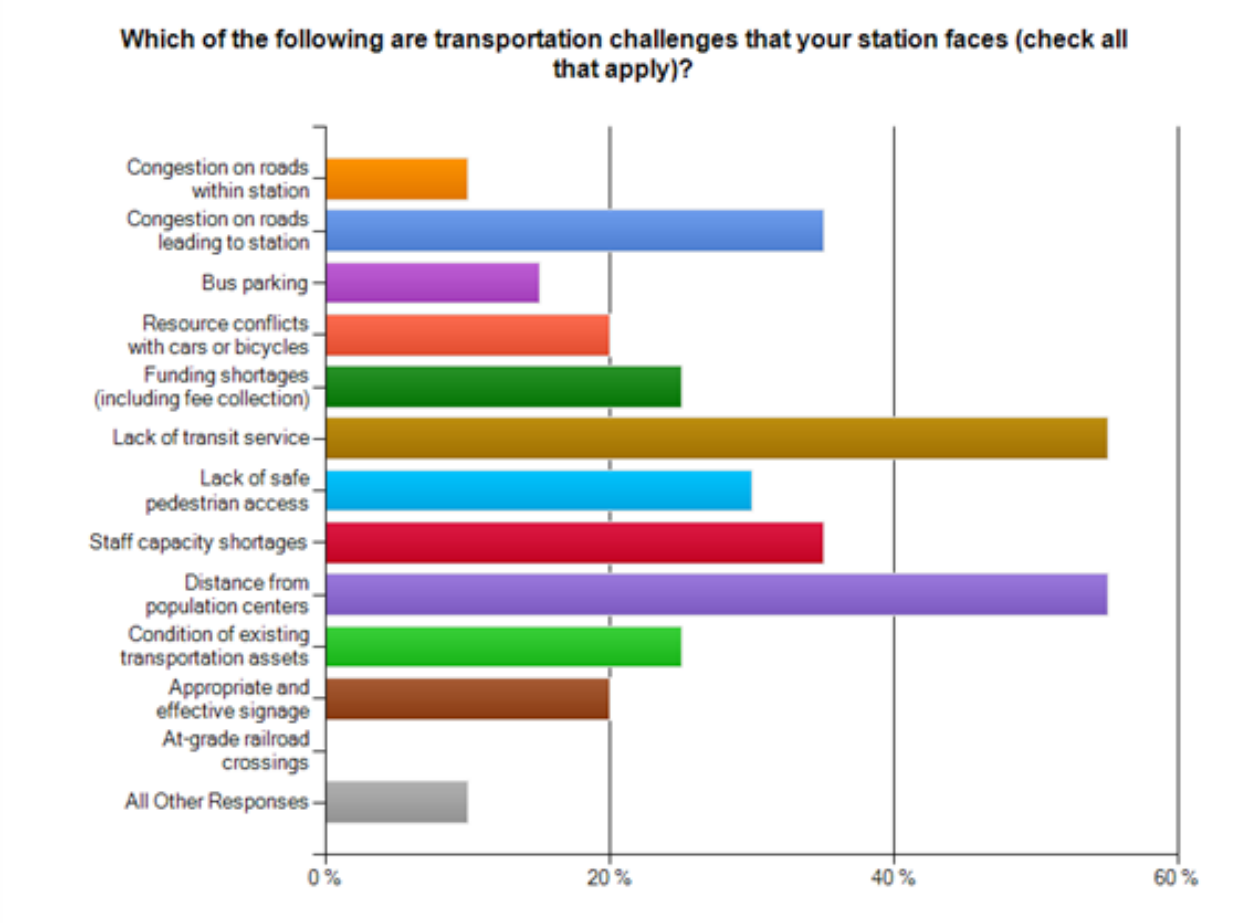
Key Transportation Challenges

The top transportation challenges cited by stations, as measured by the number of respondents, are:

- Distance from population centers (55 percent)
- Lack of transit service (55 percent)
- Lack of safe pedestrian access (30 percent)
- Staff capacity shortages (35 percent)
- Congestion on roads leading to station (35 percent)

As shown in Figure 4, other challenges include condition of existing transportation assets, resource conflicts with cars or bicycles, funding shortages, and appropriate and effective signage,. Additionally, many stations used an open-response section of the questionnaire to site poor conditions, maintenance challenges, congestion, or inadequate capacity of existing infrastructure as their most significant transportation problems. ATS can offer a means of accommodating visitors without additional strain on road infrastructure. Finally, several stations used the questionnaire to comment that their access roads are unsafe for bicyclists and pedestrians, even though the station is located in an area with a strong bicycling community or within walking distance of gateway towns. These challenges represent opportunities to improve safety for non-motorized users and to improve ATS.

Figure 4: Transportation Challenges



Promotion and Partnerships

Several stations cite the importance of advertising and awareness of existing programs, such as facility tours and non-motorized trail connections. Forty-five percent of respondents thought that promotion and marketing for existing and potential ATS would enhance their visitor program.

Many stations also recognize that partnerships are their best opportunity for improved ATS. They cite relationships with County recreation departments, city transportation departments, regional transit providers, and other Federal agencies as a means to add new bus stops near the refuges and hatcheries, expand transit service, build connections to bicycle trails, or provide sidewalks along unsafe highways.

Partnerships can help station staff to promote existing ATS connections and develop new connections. FWS should encourage partnerships between stations and local transportation planners. Station staff should be engaged in the development of city, county, and regional plans (such as long-range transportation plans, rural transportation plans, transit plans, and bicycle and pedestrian plans). Regular communication with these planners can help ensure that the station is considered when the city, county, or region is developing long-term trail routes, bicycle paths, and transit service.

Planning for ATS in Region 1

Funding

ATS projects often have different scales, constraints, and cost structures than the transportation infrastructure projects that Region 1 typically funds with Refuge Roads Program (RRP) and Deferred Maintenance funds. Also, while RRP can fund ATS studies, several key ATS infrastructure needs, such as transit vehicles and new pedestrian or bicycle paths, are not eligible expenses under RRP or Deferred Maintenance funds. However, ATS projects may qualify for a number of State and Federal funding sources, some of which are dedicated solely to ATS. These are described in detail in Section 3.3 of the LRTP.

The Paul S. Sarbanes Transit in Parks (TRIP) program offers a dedicated funding source for planning for and constructing ATS in Federal lands. Federal Land Management Agencies (FLMAs) are eligible to apply for funds, as are partner agencies (including local and State government agencies) with the support of the FLMA. Funded projects may provide access to public lands, in addition to ATS within public lands, making this grant an important funding source for many of the potential non-motorized and transit connections described in this Appendix. Since FY 2006, FWS and its partners have received over $9 million in funding from the TRIP program and its predecessor, the Alterative Transportation in Parks and Public Lands program. The Service received $6.4 million for implementation projects and $2.6 million for planning projects.

Additional funding programs with greatest applications for ATS are:

- Transportation Enhancements
- Recreational Trails Program
- Rivers, Trails, and Conservation Assistance Program

Station staff may perceive challenges in navigating the various funding sources for ATS, and the Region 1 staff should offer technical assistance, where feasible, in clarifying the applications for these sources or helping stations identify funding sources to meet their transportation needs. The TRIP Technical Assistance Center (TAC) also offers transportation-related technical assistance to all Federal Land Management Agencies to help land managers develop and implement alternative transportation projects.i

Stations may also find success in working with partners to leverage additional funds for ATS projects. Local governments, friends groups, resource agencies, and non-profit organizations often stand to benefit from the institution of ATS infrastructure based on its potential to reduce congestion, reduce resource impacts, and enhance recreation and mobility for station visitors and local residents. Partners may have access to other funding sources or grants, and stations may be more competitive for funding if they apply jointly with partners.

Project Selection

The project selection process, as delineated in Chapter 3, considers ATS and non-ATS projects jointly in establishing Region 1's five-year Transportation Improvement Plan. The review and validation of projects incorporates the LRTP goals and objectives, which include sustainability and ATS considerations. Sustainability goals and related ATS objectives have a "Medium" ranking priority. As ATS projects may meet some of the objectives under other goal areas, the transportation coordinators and regional management team (described in Chapter 3) should consider ATS projects holistically with regards to their ability to protect natural resources and aid with visitor management. The Management Team should also consider the ability of ATS projects to meet regional priorities, particularly given the ancillary benefits that ATS projects often have upon their surrounding communities. Regional priorities directly impacted by ATS, such as reduced fuel use and increased access for underserved populations, may become more important in the coming decades. One area for future consideration may be the development of quantifiable criteria for ATS in the project selection process.

Specifically, Region 1 should consider the following in project selection to support and increase ATS:

- During the call for projects, specifically remind stations to include ATS in their project submittals, and include a definition of ATS in the call for projects.
- When evaluating a road infrastructure project or improvement, consider whether an ATS project could alleviate the need for the improvement or could add supplemental benefits to the road project with little or no additional costs.
- Request letters of support from partner agencies involved in ATS project proposals to better understand the regional benefits of the project.

List of Potential Projects

The list of potential projects (Table 3) includes projects identified in the ATS Questionnaire, the FWS Transit & Trails Assessment, the RATE, and conversations with Regional FWS staff. The priority ranking is based on information provided by station and regional staff. High-priority potential projects are those with more immediate potential to institute ATS or the most pressing transportation needs. Medium- and low-priority projects may also demonstrate need and potential for ATS projects, but the conditions at these stations are currently less feasible for ATS or information is lacking as to their conditions.

Table 3: All Potential Projects in Region 1

	Refuge	Transit Distance	Trail Distance	Priority
1	Steigerwald Lake NWR *Washougal, WA*	Less than ½ mile	Direct connection	High
	– Extend C-TRAN bus service to refuge entrance, or provide safe pedestrian passage from current bus stop to refuge entrance. – Promote existing non-motorized access via the Columbia River Dike Trail.			
2	Kealia Pond NWR (HI) *Kihei, HI*	1.5 miles	Less than ½ mile	High
	– Work with Maui Bus to provide a new bus stop near the refuge entrance between Kihei and Maalaea. – Promote existing non-motorized access via the Mokulele Highway bike path.			
3	Ridgefield NWR *Ridgefield, WA*	More than 3 miles	1-3 miles	High
	– Provide a non-motorized trail to downtown Ridgefield and link with existing sidewalks. – Promote and expand the use of transit for Bird Fest and other special events.			
4	Tualatin NWR *Sherwood, OR*	Less than ½ mile	Direct connection (future)	High
	– Promote the use of existing Tri-Met bus service for connections to bicycle and light rail networks. – Support and promote the use of trail connections via Metro's Toquin and the City of Sherwood's trail systems.			
5	Kauai NWRC/Kilauea Point NWR *Kilauea, HI*	½ - 1 mile	½ - 1 mile	High
	– Provide a shuttle to connect the Kilauea Point NWR to Kauai Bus service or to the town of Kilauea. – Enhance opportunities for bicycle and pedestrian access.			
6	Nisqually NWR (WA) *Olympia, WA*	2 miles	More than 3 miles	High
	– Work with Intercity Transit to extend bus service between the refuge and the Olympia region.			
7	McNary NWR *Pasco, WA*	More than 3 miles	2 miles	Medium
	– Provide pedestrian facilities along Lake Road to offer safe pedestrian access between trailheads. – Provide a bicycle and pedestrian trail to connect with the Snake River Bridge and the extensive regional trail network.			

Table 3: All Potential Projects in Region 1

	Refuge	Transit Distance	Trail Distance	Priority
8	Leavenworth National Fish Hatchery Complex *Leavenworth, WA*	Less than ½ mile	More than 3 miles	Medium
	– Provide a regional, non-motorized trail for pedestrian and bicycle access to the complex, with potential connection to the Apple Capital Loop Trail. – Promote the use of existing LINK bus service.			
9	Turnbull NWR *Cheney, WA*	More than 3 miles	Direct connection	Medium
	– Connect the Columbia Plateau Bicycle Trail to the station's public use area, visitor contact area, and headquarters.			
10	Koontenai NWR *Bonners Ferry, ID*	More than 3 miles	Direct connection	Medium
	– Partner with the County to provide a bicycle path connecting the refuge to Bonners Ferry.			
11	Umatilla NWR *Umatilla, OR*	More than 3 miles	Direct connection	Medium
	– Promote and enhance connections via the Columbia River Heritage Trail.			
12	Quinault NFH *Quinault, WA*	More than 3 miles	More than 3 miles	Medium
	– Potential connection with Olympic National Park via transit.			
13	Oregon Coast NWR Complex *Western Oregon*	Unknown	Unknown	Medium
	– Provide a short-run shuttle bus in coordination with Ecola State Park. – Identify other opportunities for comprehensive transportation links throughout the refuge, including the use of transit for special events.			
14	James Campbell NWR *Hale'iwa, HI*	3.5 miles	Unknown	Medium
	– Work with The Bus to provide transit service to the refuge.			
15	Deer Flat NWR *Nampa, ID*	On-demand transit	4	Medium
	– Provide a non-motorized connection between the refuge and the Nampa to Stoddard Trail. – Consider potential for transit as a means to access the refuge.			
16	Willamette Valley NWRC *Corvallis, OR*	More than 3 miles	More than 3 miles	Low
	– Provide a Rail Trail for walkers and bicyclists. – Use mini-buses to connect to the Corvallis Transit System.			
17	Little Pend Oreille NWR *Colville, WA*	More than 3 miles	More than 3 miles	Low
	– Improve safety for bicycle access along State and County roads leading to refuge.			
18	Abernathy Fish Technology Center *Longview, WA*	More than 3 miles	More than 3 miles	Low
	– Improve safety for bicycle access to refuge through a bicycle path along Highway 4.			
19	Willapa NWRC *Ilwaco, WA*	More than 3 miles	NA	Low
	– Improve bicycle and pedestrian access between new station visitor center and the town of Ilwaco.			

Region 1: Alternative Transportation Refuge Questionnaire

Background:

Region 1 has initiated a Long Range Transportation Plan (LRTP) to establish goals and objectives for transportation planning, improve the Service's transportation infrastructure, and optimize transportation funding decisions. The use of alternative transportation systems and access to stations brings potential benefits of resource protection, greenhouse gas emission reductions, and visitor management solutions. FWS and the U.S. Department of Transportation Volpe Center are conducting a regional alternative transportation evaluation (RATE) in Region 1 to ensure effective integration of alternative transportation systems into the LRTP. Completing this survey helps the Region identify future needs and opportunities.

Alternative transportation systems generally include any travel means other than personal automobile, such as:

- Motorized transportation systems operating internally within stations
- Shuttles and van transit connecting stations with other destinations
- Regional transit connections (bus, light rail, trolley, commuter rail, passenger rail)
- Bicycle and pedestrian infrastructure (sidewalks, paths, bicycle lanes, regional trails)
- Water-based transportation
- Publicly and privately operated systems

Current examples of alternative transportation systems in FWS include the Columbia River Dike Trail, offering non-motorized access to Steigerwald Lake NWR in Washougal, WA, and the Tri-Met bus that connects the Tualatin River NWR to other transit in Portland, OR.

Please help us by answering the following brief questions:

1. What is your station name?

   _____

2. Is your station open to public use?

   _____

3. How far from your station is the nearest transit service, such as a local bus stop or Amtrak station?

   ☐ Less than 1/2 mile ☐ 1/2 to 1 mile ☐ 1 to 3 miles ☐ More than 3 miles

   Name of transit service provider: _____

4. Is there an opportunity for transit to assist you with special events at your station?

   _____

5. Is there an opportunity for transit to provide access for your general visitor (not during special events)?

   _____

6. How far from your station is the nearest bicycle and pedestrian regional trail?

   ☐ Direct connection to trail ☐ Less than 1/2 mile ☐ 1/2 to 1 mile
   ☐ 1 to 3 miles ☐ More than 3 miles

   Name of trail: _____

7. How would you estimate that most visitors access your station? (Please fill in approximate percentages):

   Personal vehicle _____ Public transit _____ Private transit (school bus, groups) _____

   Water-based access (including kayaks and canoes) _____ Walking _____

   Bicycling _____ Other _____

8. Do school groups or friends groups provide transportation to your station via bus or van?

   _____

9. Which of the following are transportation challenges that your station faces (check all that apply)?

   - ☐ Congestion on roads within station
   - ☐ Congestion on roads leading to station
   - ☐ Bus parking
   - ☐ Resource conflicts with cars or bicycles
   - ☐ Funding shortages (including fee collection)
   - ☐ Have not considered transportation issues
   - ☐ Lack of transit service
   - ☐ Lack of safe pedestrian access
   - ☐ Staff capacity shortages
   - ☐ Distance from population centers
   - ☐ Condition of existing transportation assets
   - ☐ Appropriate and effective signage
   - ☐ At-grade railroad crossings

10. Which of the following may enhance your visitor program?

    - ☐ Internal transit – year-round
    - ☐ Internal transit – seasonal
    - ☐ New transit service for access to the station
    - ☐ Pedestrian paths within station
    - ☐ Pedestrian paths for access to station
    - ☐ Have not considered transportation issues
    - ☐ Bicycle paths within station
    - ☐ Bicycle paths for access to station
    - ☐ Bicycle racks
    - ☐ Water-access facilities
    - ☐ Promotion and marketing for existing and potential alternative transportation systems
    - ☐ Parking management solutions

11. How would you estimate the demographics of your visitors? Please rate each group using the following categories:

Significant	Some	Few	None	No Information	
☐	☐	☐	☐	☐	Families
☐	☐	☐	☐	☐	Youth/school groups
☐	☐	☐	☐	☐	Senior citizens
☐	☐	☐	☐	☐	Mobility-impaired visitors
☐	☐	☐	☐	☐	Minority populations
☐	☐	☐	☐	☐	Low-income populations
☐	☐	☐	☐	☐	People who would use transit
☐	☐	☐	☐	☐	People who would bicycle

13. How would you estimate where your visitors live?
Please rate each group using the following categories:

Significant	Some	Few	None	No Information	
☐	☐	☐	☐	☐	Within 10 miles of stations
☐	☐	☐	☐	☐	Within 50 miles of station
☐	☐	☐	☐	☐	Tourists (more than 50 miles from station)
☐	☐	☐	☐	☐	International visitors

14. How would you estimate the activities enjoyed by your visitors?
Please rate each group using the following categories:

Significant	Some	Few	None	No Information	
☐	☐	☐	☐	☐	Hunting
☐	☐	☐	☐	☐	Fishing
☐	☐	☐	☐	☐	Wildlife Observation
☐	☐	☐	☐	☐	Photography
☐	☐	☐	☐	☐	Environmental Education
☐	☐	☐	☐	☐	Interpretation

15. Does your station have any special events with high visitation?

_____

16. Please provide a few details about the special event(s):

What is the name of the event? _____

What is the event date?_____

What is the approximate visitation for the event?_____

17. How do you handle heavy visitation for the event(s)?

☐ Use of transit

☐ Use of overflow lots on-site

☐ Partnerships for expanded parking off-site

☐ Other (please specify)_ _____

18. What are the most significant transportation problems or needs currently facing your station?

19. In the future, what might be the greatest opportunities for new or improved alternative transportation at your station?

20. Do you anticipate that visitation at your station will increase or decrease in the future?

☐ Increase ☐ Decrease ☐ Stay the Same

21. Are you actively trying to increase or decrease visitation?

☐ Increase ☐ Decrease ☐ Neither

22. How much of a concern is transportation with respect to changing visitation levels?

☐ High concern ☐ Potential/future concern ☐ Little or no concern

23. Would the station benefit from having a more detailed look at alternative transportation opportunities and challenges?

☐ Yes ☐ No ☐ Maybe

24. Is there any additional information related to transportation that you would like to share?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

The TRIP TAC website is http://www.triptac.org/, and the TRIP TAC can also be reached by phone at (877) 704-5292.

The Volpe Center completed the Transit & Trails Assessment in 2010 to inventory and prioritize ATS connections to National Wildlife Refuges across the FWS.

Appendix J

Guidance on the Federal Lands Highway Refuge Roads Program

Index

Guidance Document For The Refuge Roads Program

Prepared by the Federal Highway Administration
in cooperation with the U.S. Fish and Wildlife Service

Revised September 14, 2005

Background:

The document provides guidance to help identify projects and project enhancements that may be funded under the Refuge Roads program (RRP) category. The basic eligibility requirements were established by the Transportation Equity Act for the 21st Century (TEA-21) and modified by Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The legislation is codified in Title 23 - United States Code (23 USC). Section 204 of 23 USC requires that funds made available for refuge roads shall be used only to pay the cost of:

A) Maintenance and improvements of refuge roads.

B) Maintenance and improvement of eligible enhancement projects noted below that are located in or adjacent to wildlife refuges:
   1) Adjacent vehicular parking areas,
   2) Interpretive signage,
   3) Provisions for pedestrians and bicycles and
   4) Roadside rest areas including sanitary and water facilities

C) Administrative costs associated with such maintenance and improvements.

Examples of eligible items are included in the Appendix.

The construction of new roads is not authorized.

Title 23 USC 202(e) requires that the funds be distributed base upon relative need of the various refuges. In order to establish priorities, Title 23 USC 204(a)(6) requires that the Federal Highway Administration (FHWA) and Fish and Wildlife Service (FWS) develop and adopt by rule, safety, bridge, pavement, and congestion management systems as appropriate.

Public Roads:

Title 23 USC 101 (a) (28)) defines Refuge roads as public roads that:

1) Provide access to or within a unit of the National Wildlife Refuge System and,
2) Title and maintenance responsibility are vested in the United States Government.

Public roads are defined by 23 USC 101 (a) (27) as any road open to public travel. Because of the unique usage of refuge roads, this has to be further clarified by these guidelines. In order to be considered Public Roads, refuge roads must be opened to the general public during substantial parts of the year. Seasonal closures during nesting periods and inclement weather are permitted. However, roads only opened by permit to specific public interests, such as to hunters for specified hunting periods or photographers to access photo blinds, are not considered public roads.

Scope of Improvements:

Roads:

The refuge road funds may only be used for rehabilitation to extend the service life of an existing road and enhance safety. Such work is also known as Resurfacing, Restoration, and Rehabilitation, (3-R). 3-R work includes the placement of additional surfacing materials and/or other work necessary to return an existing roadway including shoulders, the roadside, and appurtenances, to a condition of structural adequacy.

Most 3-R work occurs on the existing road bench. Refuge Roads work generally will not involve widening beyond the existing road bench or require the construction of new retaining walls, or cuts and fills. Exceptions where RRP projects could occur off of the road bench include work on drainage structures, existing retaining walls, slope failures, bridges, and spot traffic safety improvement work.

Construction of new roads is not authorized.

Bridges:

Eligible refuge road funded work on bridges includes approach fill rehabilitation, superstructure (deck, rails & girders) replacements, abutment and foundation repairs, abutment slope protection, foundation scour repair and protection work, and piling replacements. Small bridges or large box culverts may be replaced as part of a road improvement project.

Safety Projects:

Reconstruction of refuge roads for spot traffic safety improvement project work to correct identified safety problems at high accident locations may be undertaken with RRP funds. Such work is limited to specific sites (e.g. a curve or intersection) where a history of accidents have been documented, and where solutions have been developed to reduce accidents at the site. Studies of high accident sites may be funded out of a Region's RRP program.

Many of the limitations noted in this guidance do not apply to safety improvement work. Work could include roadway widening, realignments, new paving, new guardrails or walls, new sidewalks or bicycle paths for separation of traffic, street lighting, traffic signals or other improvements which can be expected to reduce the rate or severity of accidents at that location. In addition, needed safety work such as turning lanes on non-refuge roads intersecting with refuge roads may be included in RR funded projects. These projects must be coordinated with the agency having jurisdiction of the intersecting roadway and funding should be split with that agency if possible.

Design Standards:

Because this is a 3-R program and designers will be required to stay within the existing roadway prism, design standards for new construction and re-construction are typically not applicable. Since FWS has not developed 3-R design criteria, AASHTO design criteria should be the basis for development of design exceptions where traffic safety experience does not warrant improvements to full design criteria. Achievement of AASHTO standards usually will not be possible without demonstrated and documented safety deficiencies as noted above.

Program Effectiveness Measures:

The planned performance measure for refuge roads is the change in the condition of roads and bridges as measured by the Road and Bridge Inventory systems. Besides this degree of improvement shown for FWS Regions in the annual Road Inventory Program (RIP) condition surveys, the ratio of administrative costs to construction costs, and the average cost per mile for projects in each Region will be used by FWS and FHWA to measure how efficiently and effectively each Region operates its program.

Project Selection Priorities:

23 USC 202 (e) and 204 (k) (3) also provides guidance on criteria for selection of projects to be improved under the RR program. Projects shall be selected taking into consideration:

(1) The comprehensive conservation plan for each refuge.

(2) The need for access as identified through land use planning

(3) The impact of land use planning on existing transportation facilities

(4) The National Wildlife Refuge System Administration Act of 1966

Since 23USC requires funding to be eligible based upon the relative needs of the various refuges, the selection process should favor project items that improve the condition rating factors that help establish the needs. These factors include the road condition rating which considers the number of miles of fair, poor, and failed (deficient) roads.

23 USC 204(a)(6) also requires that roads in the Federal Lands Highway program develop asset management systems to help insure the efficient use of FLH funds. These include safety, bridge, pavement and congestion management systems as applicable. The guidelines for the Fish and Wildlife Service management systems are codified in 23 CFR 972.

The requirement for a bridge management system is being met by existing FWS bridge management program. The requirement for a pavement management system is being met by the FHWA inventory and condition assessment program for FWS managed public use roads. Given the limited number of areas with congestion and safety programs, these programs are not applicable to most refuges. The Regions will consider congestion and safety in project selection, and identify any areas of specific concern to the national refuge roads coordinator.

Appendix

Eligibility

Except when unusual safety concerns require, the following work that will not be funded under the RRP program:

1) constructing new parking areas or pullouts, widening off of the present road bench,
2) realigning and relocating roads (vertical or horizontal realignments), and
3) constructing new pedestrian trails or bicycle paths.
4) recurring maintenance practices such as grading roads and mowing roadsides.

Regions can obtain assistance for RRP project planning, design, compliance and construction contracting services from the Regional Engineering Offices, their respective Federal Lands Highways (FLH) Divisions, other Federal agencies (e.g. Corps of Engineers, Bureau of Reclamation, Forest Service, etc.) or consulting engineering firms. Such activities, including program formulation and coordination and project tracking, may be paid for out of available Regional RRP funds.

Project administrative costs such as travel for on-site reviews and meetings related to the RRP program may be included in estimated project costs. However, salaries of permanent staff in FWS Regions and Refuge field stations, who are base funded, can not be charged to the FLH Program project accounts. The only exception to this may occur to pay the overtime portion of force account work. However, this higher rate should have been used in the documentation justifying the use of force account work versus doing the work by contract.

The costs for any planning studies such as Road System Evaluations, or RRP Engineering Studies, will be the responsibility of each Region using their RRP funds.

As part of an overall RRP improvement project, Regions may use RRP funding for sign upgrades to meet the Manual of Uniform Traffic Control Devices standards. However, routine replacement due to wear and age is ineligible for FLH Program funding.

On a specific road improvement project, no more than 5% of the individual RRP improvement project funds may be used for non-roadway related improvements. Stand alone enhancement projects not associated with a specific road improvement project are not eligible for funding.

Specific Examples of Project Refuge Road Eligibility Criteria

The following lists provide general guidance as to what may be funded.

WORK ITEMS THAT ARE ELIGIBLE FOR FUNDING:
Project Support Items:

- Traffic engineering and safety studies.
- Identification and surveillance of accident locations.
- Road Inventories.
- Bridge, pavement, safety and congestion management systems.
- Necessary environmental studies and resource investigations confined to the general roadway construction limits.
- Project-related re-vegetation and control of invasive plants.
- Necessary architectural and landscape engineering services.
- Engineering design for roads, bridges, adjacent vehicle parking areas, provisions for pedestrian and bicycles, and roadside rest areas including sanitary and water facilities.
- Construction engineering for contract administration, inspection and testing.
- Necessary interagency program/project formulation meetings.
- Interagency program review meetings (per interagency agreement).
- Necessary interagency project coordination.
- Research part of coordinated technology implementation program.

Construction and Improvements Items:

- Resurfacing (milling, recycling and overlaying) existing pavements.
- Excavating and replacing failed base courses and poor subgrade materials.
- Replacing, upgrading or relocating deteriorated, undersized or poorly located drainage structures (aprons, inlets, culverts and headwalls etc.).
- Improvements to facilitate wildlife crossings, passage of aquatic organisms and habitat connectivity.
- Repair or upgrading existing guardrails or guardwalls.
- Minor widening of the roadway, realigning of intersections, adding of turn lanes, intersection islands, or pullouts, flattening of curves, or adjusting curve superelevation if the work can be accomplished on the existing road bench.
- Repairing, rehabilitating or replacing existing retaining walls if the estimated cost of a single wall or site is $200,000 or less.
- Repairing and or stabilizing landslides, severely eroding or failing slopes if the estimated cost of a single site is $200,000 or less.
- Projects off of the roadway bench may be allowed to widen or realign the road, construct new pullouts or add other features such as comfort stations and interpretive signage provided that they total no more than 5% of the project's construction costs.
- Removing or grinding existing pavement to convert a road to an aggregate surface.
- Replacing, upgrading or adding new pavement markings and signage to address changing traffic patterns, new uses or safety problems as well as to meet current standards if occurring in conjunction with an RR roadway project. Sign or marking replacement due to age, damage or deterioration is not eligible for funding, unless undertaken as part of a road rehabilitation project.
- Engineered pavement overlays that add structural value, design life or improved skid resistance.

- Double bituminous surface treatments and chip seals that are part of predefined stage construction or form final surface on low volume roads.
- Engineered rehabilitation or reconstruction of pavement structures, bridges and bridge decks.
- Engineered spot safety improvements resulting from safety studies.
- Upgrading of substandard traffic barriers and bridge rails to current standards.
- Replacement of nonstandard traffic regulatory and guide signs.
- Upgrading substandard or nonconforming traffic markings (one time only).
- A single refuge entrance sign if the sign conforms to FWS standards, is in a safe location, is part of an adjacent Refuge Roads project, and is of reasonable cost ($10,000 maximum including design, materials and installation).
- Accommodating traffic and pedestrians through construction zones.
- Public approach roads and interchange ramps that are under the jurisdiction and responsibility of the FWS.
- Installation of warranted roadway lighting.
- Adjustment of utilities directly related to roadway work.
- Conduits crossing under the roadway to accommodate future planned utilities.
- Landscaping and native plant seeding of areas disturbed by the RRP program projects.
- Landscaping required to meet Environmental Impact Study mitigation measures resulting from roadway construction.
- Construction of erosion control and environmental mitigation measures directly related to roadway construction.
- Experimental features where there is a planned monitoring evaluation schedule.
- Public parking lots or pull-offs to trail heads adjacent to RRP projects, interpretive areas, public lodging, visitor center, (including necessary supporting retaining walls, protective railings and adjacent perimeter sidewalk).
- Provisions for pedestrians and bicyclists within/adjacent to roadway prism when warranted for safety reasons.
- Maintenance and improvement of existing recreational trails in accordance with the FHWA/FWS Recreational Trails Guidance with total funding not to exceed 5% of the national program funds.
- Restoration of borrow pits created by projects funded from the RRP program.
- Force account and day labor, including materials and equipment rental being performed in accordance with approved plans and specifications, that has been determined to be cost-effective (public interest).
- All the aforementioned work can be performed on existing parking areas, pullouts, sidewalks or bicycle paths if the work is incidental to a RRP roadway project.

WORK ITEMS THAT WILL GENERALLY NOT BE ELIGIBLE FOR FUNDING:

(Funding will be determined on a case-by-case exception basis taking into consideration overall relative Refuge Road program priorities)

Project Support Items:

- Acquisition of scenic easements and scenic or historic sites.
- Brochures for public use unless they are prepared for refuges with roads impacted by improvements.

Construction and Improvements Items:

- Acquisition of alternative transportation systems unless it would facilitate visitor access and improve usage of the roadway system.
- Bike paths, unless they are part of the refuge unit's approved Comprehensive Conservation Plan, constructed in conjunction with RR program projects, and are:
  - part of a roadway prism necessary for safety reasons and if bike traffic warrants.
  - independent paths used for transportation and safety reasons based on accident and traffic data analysis.
- Construction of visitor information centers and related items.
- Construction of roadside rest area including sanitary and water facilities.
- Bridge painting work on structures (painting of major large structures considered on a case-by-case exception basis).
- Public roads which provide access to areas under the jurisdiction and responsibility of the FWS but which are not owned by the Service and/or are not required to be maintained by the Service.

WORK ITEMS THAT ARE NOT ELIGIBLE FOR FUNDING:

Project Support Items:

- General refuge planning.

- Non-program specific conferences, field trips, or training conferences.
- Cultural resources investigations and work outside roadway construction limits

Construction or Improvements Items:

- Construction of new access roads, new campground roads and related parking areas.
- Cyclic roadway maintenance work including chip and slurry seals (seal coats), pavement patching, roadway grading, shoulder and ditch grading, cleaning culverts, snow removal, roadside mowing, vegetation control, normal sign repair and traffic markings.
- Seal coats on top of new asphalt concrete pavements.
- Cyclic bridge maintenance work including cleaning and repairing bridge joints, cleaning repairing bridge drainage, and repairing other bridge appurtenances.
- Landscaping and irrigation systems of areas not disturbed by refuge road construction.
- Landscaping of disturbed areas with non-native plant species.
- Utilities and buildings not disturbed by construction.
- Sanitation facilities not disturbed by construction.
- Walls and erosion protection that are not part of or support the roadway prism.
- Recreational boat launching facilities and ramps.
- General refuge development projects.
- Roads that serve only an administrative site such as refuge housing, maintenance area or refuge dormitory (or a combination of these).
- Roads that provide access to Refuge Headquarters which are not open to the general public (i.e., not a visitor center).
- Roads that are primarily used for administrative purposes and open to the public only for very limited periods during the year under restrictive conditions.
- Restoration of borrow pits (or portions of borrow pits) created by projects funded with non Refuge Road program funds.
- Repairs to or replacement of fences not disturbed by Refuge Road construction.

Long Range Transportation Plan for Fish and Wildlife Service Lands in Region 1

U.S. Fish & Wildlife Service - Region 1