Appendix A

The Relationship of the Port-Orford-Cedar Range-wide Assessment to Other Legal Documents and Authorities

June 2001

Other than an appendix reference the Northwest Forest Plan does not specifically address Port-Orford-cedar or the root disease caused by *Phytophthora lateralis*, but it does place emphasis on maintenance of riparian habitat and sustaining ecological viability of all native species.

Existing Forest Service and Bureau of Land Management (BLM) Plans within the range of Port-Orford-cedar recommend management actions that reduce the spread and severity of the root disease, maintain Port-Orford-cedar as a component of appropriate forest ecosystems, and incorporate analysis of effects to Port-Orford-cedar into environmental analyses and project planning (USDA 1989, 1990, 1995a, b, c; USDI 1995a, b, c).

The Secretary of Agriculture, through the Forest Service, is authorized "to assist in … the prevention and control of insects and diseases affecting trees and forests" on non-federal lands (USC, Title 16, Chapter 41, Sec. 2101). The Cooperative Forestry Assistance Act of 1978, as amended, authorizes the Forest Service to provide technical and financial assistance on forest lands administered by other federal agencies, tribal lands, and on State and private forest lands.

This document does not contain a comprehensive analysis of Port-Orford-cedar on all ownerships within the range of Port-Orford-cedar and does not make any blanket recommendations for all lands within the range of Port-Orford-cedar. It provides tools and information for any landowner who manages Port-Orford-cedar as a component of their forest.

This assessment is closely tied to other ongoing and proposed analyses. These include watershed analyses, late-successional reserve assessments, transportation management plans, the BLM's Plant Genetics Plan, analyses of Forest Service road networks, and off-highway vehicle strategies.

National emphasis on managing and reducing the impacts on native ecosystems from non-native organisms is increasing. In 1996, a National Invasive Species Act was passed, which targeted non-native species for control measures. The National Invasive Species Council was established in 1999 to oversee management and prevention programs for control of invasive species. *P. lateralis* is an invasive species. It is probably not native to North America and certainly not native to the natural range of Port-Orford-cedar.

Literature Cited

U.S. Department of Agriculture, Forest Service. 1989. Siskiyou National Forest land and resource management plan. Portland, OR.

U.S. Department of Agriculture, Forest Service. 1990. Siuslaw National Forest land and resource management plan. Portland, OR.

U.S. Department of Agriculture, Forest Service. 1995a. Land and resource management plan, Klamath National Forest. Yreka, CA.

U.S. Department of Agriculture, Forest Service. 1995b Land and resource management plan, Six Rivers National Forest. Eureka, CA.

U.S. Department of Agriculture, Forest Service. 1995c. Shasta-Trinity National Forest land and resource management plan. Vallejo, CA.

U.S. Department of the Interior, Bureau of Land Management. 1995a. Coos Bay District record of decision and resource management plan. North Bend, OR.

U.S. Department of the Interior, Bureau of Land Management. 1995b. Record of decision and resource management plan, Medford District. Medford, OR.

U.S. Department of the Interior, Bureau of Land Management. 1995c. Record of decision and resource management plan, Roseburg District. Roseburg, OR.

Appendix B

Occurrence of Plant Associations with Port-Orford-Cedar by Ecoregion or Subsection

	Ecoregion or Subsection												
	Mid-coastal Sedimentary and Southern Oregon Coastal	Coastal Siskiyous	Eastern Franciscan	Gasquet Mountain Ultramafics	Serpentine Siskiyous	Western Jurassic	Siskiyou Mountains	Inland Siskiyous	Pelletreau Ridge	Rattlesnake Creek	Eastern Klamath Mountains	Lower Scott Mountains	Upper Scott Mountains
				California	Oregon		California	Oregon					
Port-Orford-cedar/Hairy Honeysuckle/Fescue								X					
Port-Orford-cedar/Huckleberry Oak/ Beargrass								X					
Port-Orford-cedar/Pacific Rhododendron-Salal	X	X	X	X	X	X	X	X					
Port-Orford-cedar/Salal			X	X		X	X						
Port-Orford-cedar/Western Azalea			X	X		X	X		X				
Port-Orford-cedar-Douglas-fir/California Hazelnut							X						
Port-Orford-cedar-Douglas-fir/Hazelnut//6-R					X								
Port-Orford-cedar-Douglas-fir/Huckleberry Oak			X	X		X	X		X				
Port-Orford-cedar-Douglas-fir/Spicebush											X	X	
Port-Orford-cedar-Douglas-fir-Alder/Vine Maple-Oregon-grape							X						
Port-Orford-cedar/Evergreen Huckleberry/ Western Swordfern	X												
Port-Orford-cedar-Incense Cedar-Alder				X		X	X						
Port-Orford-cedar - Mixed Conifer/ Huckleberry Oak - Western Azalea							X					X	X
Port-Orford-cedar-Mixed Conifer/Western Azalea-Dwarf Tanbark											X	X	X
Port-Orford-cedar-Mountain Hemlock/Bush Chinquapin													X
Port-Orford-cedar-Mountain Hemlock/ Labrador Tea													X
Port-Orford-cedar-Mountain Hemlock/Sierra Laurel													X
Port-Orford-cedar-Red Fir/Sadler Oak-Thinleaf Huckleberry				X			X						
Port-Orford-cedar-Red Fir/Sadler Oak-Thinleaf Huckleberry//R-6								X					
Port-Orford-cedar-Red Fir/Sitka Alder/ California Pitcher Plant							X						
Port-Orford-cedar-Red Fir/Sitka Alder -Sadler Oak							X						
Port-Orford-cedar-Red Fir-Brewer Spruce/ Sadler Oak-Huckleberry Oak							X						
Port-Orford-cedar-Tanoak/Salal					X			X					
Port-Orford-cedar-White Fir/Dwarf Oregon-grape								X					

	Ecoregion or Subsection												
	Mid-coastal Sedimentary and Southern Oregon Coastal	Coastal Siskiyous	Eastern Franciscan	Gasquet Mountain Ultramafics	Serpentine Siskiyous	Western Jurassic	Siskiyou Mountains	Inland Siskiyous	Pelletreau Ridge	Rattlesnake Creek	Eastern Klamath Mountains	Lower Scott Mountains	Upper Scott Mountains
				California	Oregon		California	Oregon					
Port-Orford-cedar-Western Hemlock/Sierra Laurel								X					
Port-Orford-cedar-Western Hemlock/ Swordfern	X												
Port-Orford-cedar-Western White Pine//Dry Herb Complex													X
Port-Orford-cedar-Western White Pine/ Huckleberry Oak			X	X		X	X		X				
Port-Orford-cedar-Western White Pine/ Labrador Tea/California Pitcher Plant			X	X			X						X
Port-Orford-cedar-Western White Pine/ Labrador Tea/California Pitcher Plant// Coastal				X		X	X						
Port-Orford-cedar-Western White Pine/Sitka Alder												X	X
Port-Orford-cedar-Western White Pine/ Thinleaf Huckleberry													X
Port-Orford-cedar-Western White Pine/ Western Azalea-Dwarf Tanbark-Labrador Tea				X		X	X		X				
Port-Orford-cedar-Western White Pine//Wet Herb Complex							X						X
Port-Orford-cedar-White Fir/Bush Chinquapin-Western Azalea													X
Port-Orford-cedar-White Fir/Dwarf Oregon-grape					X								
Port-Orford-cedar-White Fir//Herb				X			X		X				
Port-Orford-cedar-White Fir/Huckleberry Oak				X			X		X				
Port-Orford-cedar-White Fir/Sadler Oak				X			X						
Port-Orford-cedar-White Fir/Sierra Laurel-Bush Chinquapin													X
Port-Orford-cedar-White Fir/Sitka Alder						X	X						
Port-Orford-cedar-White Fir/Vine Maple							X						
Port-Orford-cedar-White Fir/Western Azalea				X		X	X						
Port-Orford-cedar-White Fir/Western Azalea-Huckleberry Oak							X					X	X
Port-Orford-cedar-White Fir -Western White Pine/Huckleberry Oak				X			X						
Douglas-fir/Salal-Dwarf Oregon-grape		X											
Douglas-fir/Salal-Pacific Rhododendron	X	X			X			X					
Douglas-fir/Salmonberry/Swordfern								X					

	Ecoregion or Subsection												
	Mid-coastal Sedimentary and Southern Oregon Coastal	Coastal Siskiyous	Eastern Franciscan	Gasquet Mountain Ultramafics	Serpentine Siskiyous	Western Jurassic	Siskiyou Mountains	Inland Siskiyous	Pelletreau Ridge	Rattlesnake Creek	Eastern Klamath Mountains	Lower Scott Mountains	Upper Scott Mountains
				California	Oregon		California	Oregon					
Jeffrey Pine/Huckleberry Oak-Pinemat Manzanita		X											
Jeffrey Pine/Huckleberry Oak-Pinemat Manzanita-Box-leaved Silk Tassel		X											
Jeffrey Pine-Port-Orford-cedar/Huckleberry Oak				X			X						
Tanoak-Bigleaf maple-Canyon Live Oak/ Swordfern								X					
Tanoak-Douglas-fir/Salal-Dwarf Oregon-grape								X					
Tanoak-Douglas-fir/Salal-Evergreen Huckleberry		X			X								
Tanoak-Douglas-fir/Salal-Pacific Rhododendron		X						X					
Tanoak-Douglas-fir-Canyon Live Oak/Dwarf Oregon-grape					X			X					
Tanoak-Douglas-fir-Canyon Live Oak/Poison Oak					X								
Tanoak-Golden Chinquapin/Salal-Sadler Oak					X			X					
Tanoak-Golden Chinquapin-Sugar Pine					X			X					
Tanoak-Port-Orford-cedar/Dwarf Oregon-grape/Twinflower			X	X		X	X		X				
Tanoak-Port-Orford-cedar/Evergreen Huckleberry			X	X		X	X			X			
Tanoak-Port-Orford-cedar/Evergreen Huckleberry-Western Azalea			X	X		X	X		X				
Tanoak-Port-Orford-cedar/Huckleberry Oak			X	X		X	X						
Tanoak-Port-Orford-cedar/Pacific Rhododendron						X	X						
Tanoak-Port-Orford-cedar/Red Huckleberry			X	X		X	X		X				
Tanoak-Port-Orford-cedar/Salal		X	X	X	X	X	X	X	X				
Tanoak-Port-Orford-cedar/Vine Maple			X	X		X	X						
Tanoak-Port-Orford-cedar/Vine Maple//6-R					X								
Tanoak-Port-Orford-cedar-Alder//Riparian			X	X		X							
Tanoak-Port-Orford-cedar-California Bay/ Evergreen Huckleberry			X	X		X	X						
Tanoak-Port-Orford-cedar-Red Alder// Riparian							X		X	X			
Tanoak-Port-Orford-cedar-Redwood/ Evergreen Huckleberry				X		X							

	Ecoregion or Subsection												
	Mid-coastal Sedimentary and Southern Oregon Coastal	Coastal Siskiyous	Eastern Franciscan	Gasquet Mountain Ultramafics	Serpentine Siskiyous	Western Jurassic	Siskiyou Mountains	Inland Siskiyous	Pelletreau Ridge	Rattlesnake Creek	Eastern Klamath Mountains	Lower Scott Mountains	Upper Scott Mountains
				California	Oregon		California	Oregon					
Tanoak-Port-Orford-cedar-Western Hemlock/ Evergreen Huckleberry			X	X		X							
Tanoak-Western white pine/Huckleberry oak/Beargrass	X	X											
Tanoak-Western Hemlock/Evergreen Huckleberry/Swordfern	X												
Western Hemlock-Tanoak-California Bay	X												
Western Hemlock/Evergreen Huckleberry/ Swordfern	X												
Western Hemlock/Pacific Rhododendron-Dwarf Oregon-grape	X							X					
Western Hemlock/Sadler Oak-Salal-Pacific Rhododendron					X			X					
Western Hemlock/Salal-Pacific Rhododendron	X							X					
Western Hemlock/Swordfern	X												
White Fir/Beargrass					X								
White Fir/Dwarf Oregon-grape/Twinflower								X					
White Fir/Dwarf Oregon-grape/Vanillaleaf								X					
White Fir/Huckleberry Oak					X			X					
White Fir/Pacific Rhododendron-Sadler Oak					X			X					
White Fir/Pinemat Manzanita					X								
White Fir-Brewer Spruce/Common Prince's Pine-Whitevein Pyrola					X			X					
White Fir-Douglas-fir/Baldhip Rose								X					
White Fir-Douglas-fir/Poison Oak								X					
White Fir-Tanoak/Common Prince's Pine								X					

Appendix C

Unique Species and Regional Endemic, Rare or Sensitive Plants Found in Ecology Plots Used for Classification of Port-Orford-Cedar and Species Known to Occur with Port-Orford-Cedar

Revised 5/13/02 by Lisa Hoover and Maria Ulloa

Scientific Name	Common Name
Antennaria suffrutescens Greene	evergreen everlasting
Arabis koelheri Howell var. *stipitata* Roll.	stipitate rock-cress
Arabis macdonaldiana Eastwood	McDonald's rock-cress
Arctostaphylos hispidula Howell	Howell's manzanita
Arctostaphylos klamathensis Edwards, Keeler-Wolf & Knight	Klamath manzanita
Arnica cernua Howell	serpentine arnica
Cardamine nuttallii Greene var. *gemmata* Greene Roll. (*C. gemmata, D. gemmata*)	yellow-tubered toothwort
Carex gigas (Holm) Mackenzie includes *C. scabriuscula* Mack	Siskiyou sedge
Castilleja hispida Benth ssp. *brevilobata* (Piper) Chuang & Hechard	short-lobed Indian paintbrush
Castilleja miniata Hook ssp. *elata* (Piper) Munz (*Castilleja elata*)	Siskiyou Indian paintbrush
Chaenactis suffrutescens A. Gray	Shasta chaenactis
Cypripedium californicum A. Gray	California lady's-slipper
Cypripedium fasciculatum Kell. S. Watson	clustered lady's-slipper
Cypripedium montanum Lindley	mountain lady's-slipper
Darlingtonia californica Torrey	California pitcher plant
Dicentra formosa (Haw.) Walp. ssp. *oregana* (Eastw.) Munz	Oregon bleeding heart
Epilobium oreganum Greene	Oregon willow-herb
Erigeron cervinus Greene (includes *E. delicatus* Cronq.)	Siskiyou daisy
Eriogonum pendulum Wats.	Waldo buckwheat
Eriogonum ternatum Howell	ternate buckwheat
Eriogonum umbellatum Torrey var. *humistratum* Rev.	Mt. Eddy buckwheat
Erythronium hendersonii S. Watson	Henderson's fawn lily
Erythronium howellii Wats.	Howell's fawn lily
Gentiana setigera (Gray) (*G. bisetaea*)	Waldo gentian
Hastingsia bracteosa S. Wats var. *bracteosa* (Becking) Lang & Zika (*H. bracteosa, Schoenolirion bracteosum*)	largeflowered rushlily
Horkelia sericata S. Watson	Howell's horkelia
Iris innominata L. Henderson	Del Norte iris

Iris tenax Douglas ssp. *klamathensis* L. Lenz	Orleans iris
Juncus dudleyi Wieg.	Dudley's rush
Lathyrus delnorticus C. Hitchc.	Del Norte pea
Lewisia oppositifolia (Wats) Rob.	opposite-leaved lewisia
Lilium bolanderi S. Watson	Bolander's lily
Lilium pardalinum Kellogg ssp. *vollmeri* (East.) M. Skinner	Vollmer's lily
Lilium pardalinum Kellogg ssp. *wigginsii* (Beane &Vollmer) M. Skinner	Wiggin's lily
Lilium rubescens S. Watson	redwood lily
Lilium washingtonianum Kellogg ssp. *purpurascens* (Stearn) M. Skinner	purple-flowered Washington lily
Lomatium howellii S. Watson	Howell's lomatium
Penstemon filiformis (Keck) Keck	thread-leaved beardtongue
Phacelia dalesiana J. Howell	Scott Mountain phacelia
Pinguicula vulgaris ssp. *macroceras* (Link) Calder & R. Taylor *P. macroceras* var. *macroceras,* *P. macroceras* ssp. *Nortensis*	Del Norte butterwort
Pityopus californicus (Eastw.) H. Copel	California pinefoot
Poa piperi A. Hitchc.	Piper's blue grass
Polystichum californicum (D. C. Eat) Diels	California swordfern
Potentilla cristae W. Ferlatte & Strother	crested potentilla
Pyrrocoma racemosa (Nutt.) Torrey & A. Gray var. *congesta* (Greene) G. Brown & Keil	Del Norte pyrrocoma
Raillardella pringlei Greene	showy raillardella
Ribes marshallii Greene	Marshall's gooseberry
Rubus nivalis Douglas	snow dwarf bramble
Salix delnortensis Schneid	Del Norte willow
Sanguisorba officinalis L.	great burnet
Sanicula peckiana J. F. Macbr.	Peck's sanicle
Sedum laxum (Britton) A. Berger ssp. *flavidum* Denton	pale yellow stonecrop
Sedum laxum (Britton) A. Berger ssp. *Heckneri* (M. Peck) R. T. Clausen	Heckner's stonecrop
Smilax jamesii Wallace	English Peak Greenbriar
Streptanthus howellii Wats	Howell's jewelflower
Tauschia glauca (J. Coulter & Rose) Mathias & Constance	glaucous tauschia
Triteleia crocea (Alph. Wood) Greene var. *modesta* (H. M. Hall) Hoover	Trinity Mountain triteleia
Vancouveria chrysantha Greene	Siskiyou inside-out-flower
Veratrum insolitum Jepson	Siskiyou false-hellebore
Viola primulifolia L. var. *occidentalis* (Gray) L. E. McKenney & R. J. Little	western bog violet

Appendix D

Port-Orford-Cedar Short-term Raised Bed Common Garden Study Analysis of Variance Tables and Means

Table D.1—Analysis of variance (ANOVA) for height traits for watershed and breed zone models

Values for height columns are probabilities of getting as high or higher F-values when Ho: is true.

Source of Variation	Degrees of Freedom	2-Yr Total Height	1-Yr Total Height	2nd Yr Height Growth
Locations	1	.0010	.0252	.0005
Treatments	1	.6384	.4016	.0022
Loc * Trt	1	.0414	.6468	.0006
Blocks	8	.0001	.0001	.0001
Watershed Model:				
Watersheds	9	.0001	.0001	.0001
Stands (wtrshd)	42	.0074	.0112	.0185
Families (stand)	246	.0001	.0001	.0001
Loc * Wtrshd	9	.0001	.1758	.0002
Loc * Stand	42	.9999	.9999	.4500
Loc * Fam (stand)	246	.0001	.0052	.0001
Trt * Wtrshd	9	.3470	.4529	.1291
Trt * Stand (wtrshd)	42	.2824	.3001	.0691
Trt * Fam (stand)	246	.9999	.1041	.9999
Loc * Trt * Wtrshd	9	.2013	.0374	.4884
Residual Mean Square	2914	205.46	34.86	110.42
Breed Zone Model:				
Breed Zones	3	.0001	.0001	.0001
Seed Zones (bz)	6	.0001	.0001	.0001
Families (sdz)	288	.0001	.0001	.0001
Loc * BZ	3	.0001	.5465	.0001
Loc * SdZ (bz)	6	.8447	.2259	.5505
Loc * Fam (sdz)	288	.0001	.0060	.0001
Trt * BZ	3	.0639	.3957	.0017
Trt * SdZ (bz)	6	.2274	.4035	.2289
Trt * Fam (sdz)	288	.9999	.0586	.9999
Loc * Trt * Bz	3	.4800	.0565	.5823
Residual Mean Square	2961	206.53	34.92	111.17

Table D.2—Least square means and standard errors main effects and some interactions for the watershed model for height (in centimeters) traits[1]

Effect	Loc	Trt	Wtrshd	LSMean Ht2	Std Error Ht2	LSMean Ht1	Std Error Ht1	LSMean Ht2-1	Std Error Ht2-1
Loc	Dor			114.29	2.77	60.71	3.02	53.58	1.08
Loc	Hum			94.52	2.77	49.02	3.02	45.50	1.08
Trt		Sha		103.39	2.77	56.81	3.02	46.57	1.07
Trt		Sun		105.42	2.77	52.92	3.02	52.51	1.07
Loc*Trt	Dor	Sha		108.87	3.80	61.61	4.25	47.25	1.42
Loc*Trt	Dor	Sun		119.72	3.80	59.81	4.25	59.91	1.42
Loc*Trt	Hum	Sha		97.92	3.80	52.02	4.25	45.89	1.42
Loc*Trt	Hum	Sun		91.12	3.80	46.02	4.25	45.10	1.42
Wtrshd			App	103.40	3.27	54.31	2.46	49.11	1.71
Wtrshd			Coq	115.97	2.31	59.34	2.21	56.62	1.04
Wtrshd			Dun	124.52	3.32	63.54	2.47	60.96	1.75
Wtrshd			Ilv	101.75	4.41	53.15	2.82	48.63	2.44
Wtrshd			Kla	99.25	3.61	52.88	2.56	46.37	1.93
Wtrshd			Rog	105.80	3.03	55.41	2.40	50.37	1.56
Wtrshd			Sac	85.88	3.48	48.48	2.51	37.39	1.84
Wtrshd			Six	127.46	4.42	64.67	2.82	62.82	2.45
Wtrshd			Smh	100.66	2.80	53.17	2.33	47.43	1.40
Wtrshd			Trn	79.38	4.59	43.70	2.89	35.71	2.56

[1] HT1 = first year total height; HT2 = second year total height; HG2-1 = second year height growth increment; traits are averages across both sites.

Table D.3—Least square means and standard errors main effects and some interactions for the breed zone model for height (in centimeters) traits [1]

Effect	Loc	Trt	BZ	SdZ	LSMean Ht2	Std Error Ht2	LSMean Ht1	Std Error Ht1	LSMean Ht2-1	Std Error Ht2-1
Loc	Dor				109.86	2.69	59.08	3.00	50.79	1.01
Loc	Hum				91.67	2.69	47.48	3.00	44.19	1.01
Trt		Sha			99.91	2.68	55.15	3.00	44.76	0.98
Trt		Sun			101.62	2.68	51.41	3.00	50.21	0.98
Loc*Trt	Dor	Sha			104.60	3.74	59.95	4.24	44.64	1.36
Loc*Trt	Dor	Sun			115.13	3.74	58.21	4.24	56.93	1.36
Loc*Trt	Hum	Sha			95.23	3.74	50.36	4.24	44.87	1.36
Loc*Trt	Hum	Sun			88.11	3.74	44.61	4.24	43.50	1.36
BZ			NC		115.97	2.03	59.61	2.15	56.36	0.81
BZ			NI		102.25	2.19	53.69	2.19	48.55	0.95
BZ			SC		101.90	2.41	53.62	2.25	48.28	1.12
BZ			SI		82.96	2.53	46.20	2.28	36.76	1.21
SdZ(BZ)			NC	071	124.38	2.57	63.31	2.29	61.08	1.24
SdZ(BZ)			NC	072	118.15	2.04	60.33	2.16	57.82	0.82
SdZ(BZ)			NC	081	105.36	2.53	55.18	2.28	50.18	1.20
SdZ(BZ)			NI	511	104.07	2.51	54.58	2.27	49.49	1.19
SdZ(BZ)			NI	512	100.42	2.53	52.81	2.28	47.61	1.20
SdZ(BZ)			SC	091	105.59	3.24	55.02	2.48	50.57	1.70
SdZ(BZ)			SC	301	95.42	2.53	51.65	2.28	43.75	1.20
SdZ(BZ)			SC	302	104.70	3.96	54.19	2.72	50.51	2.16
SdZ(BZ)			SI	331	80.03	3.60	43.90	2.60	36.13	1.93
SdZ(BZ)			SI	521	85.88	2.49	48.49	2.27	37.38	1.17
Loc*BZ	Dor		NC		127.35	2.77	65.43	3.02	61.92	1.09
Loc*BZ	Dor		NI		112.53	2.94	59.82	3.05	52.71	1.26
Loc*BZ	Dor		SC		110.08	3.16	59.19	3.10	50.88	1.46
Loc*BZ	Dor		SI		89.49	3.29	51.86	3.13	37.63	1.57
Loc*BZ	Hum		NC		104.58	2.77	53.78	3.02	50.80	1.09
Loc*BZ	Hum		NI		91.96	2.94	47.57	3.05	44.39	1.26
Loc*BZ	Hum		SC		93.72	3.16	48.05	3.10	45.68	1.46
Loc*BZ	Hum		SI		76.42	3.29	40.53	3.13	35.88	1.57
Trt*BZ		Sha	NC		114.46	2.75	61.73	3.02	52.73	1.05
Trt*BZ		Sha	NI		101.32	2.90	55.70	3.05	45.62	1.20
Trt*BZ		Sha	SC		100.18	2.10	55.14	3.10	45.04	1.37
Trt*BZ		Sha	SI		83.69	3.22	48.04	3.12	35.64	1.47
Trt*BZ		Sun	NC		117.47	2.75	57.48	3.02	59.98	1.05
Trt*BZ		Sun	NI		103.17	2.90	51.69	3.05	51.48	1.20
Trt*BZ		Sun	SC		103.62	3.10	52.11	3.10	51.52	1.37
Trt*BZ		Sun	SI		82.23	3.22	44.35	3.12	37.88	1.47

[1] HT1 = first year total height; HT2 = second year total height; HG2-1 = second year height growth increment; traits are averages across both sites.

Table D.4—Distribution of variance components (%) for height traits using the watershed model

Varcomp Trait	*Watershed*	*Stand/W*	*Family/S*	*Loc x W*	*Loc x S*	*Loc x F*	*Block*	*Error*
1st Yr Ht	26.5**	2.8**	9.1**	0.1	0.0	1.2**	35.0**	25.4
HG 2nd Yr	28.0**	2.6**	2.8**	3.6**	0.1	6.7**	11.2**	45.0
2nd Yr Ht	37.4**	3.4**	6.7**	1.6**	0.0	4.5**	9.9**	36.5
Total 2nd Ht.	←←← 47.5 →→→		←←← 6.1 →→→			←←← 46.4 →→→		

**** = significant at p<0.01.**

Table D.5—Distribution of variance components (%) for height traits using the breed zone model

Varcomp Trait	*Breed Zone*	*Seed Zone/BZ*	*Family/SZ*	*Loc x BZ*	*Loc xSZ*	*Loc x F*	*Block*	*Error*
1st Yr Ht	18.6**	5.6**	12.5**	0.0	0.1	1.2**	36.0**	26.0
HG 2nd Yr	21.8**	6.1**	4.9**	3.2**	0.0	7.1**	11.4**	45.5
2nd Yr Ht	28.1**	7.7**	10.2**	1.8**	0.0	4.6**	10.2**	37.4
Total 2nd Ht.	←←← 46.0 →→→		←←← 6.1 →→→			←←← 47.6 →→→		

**** = significant at p<0.01.**

Appendix E

Details of Resistance Screening Process

The initial screening of 193 parent trees from the Siskiyou and Six Rivers National Forests utilized the wound inoculation technique. The parent trees tested were selected from areas where other Port-Orford-cedar had died, likely from *Phytophthora lateralis*. The range of lesion lengths varied widely among these selected trees, with some trees having small lesion scores comparable to the best trees previously tested, while other trees appeared to have little resistance based upon this technique. Since this was early in the testing process, rooted cuttings from over half of the selections were kept and placed into a breeding or preservation orchard.

Ten branch tips were collected from each of 190 candidate trees from five sites on the Bureau of Land Management Medford District. Most of the candidate trees were from forest areas with established *P. lateralis* infections. Branches for the five sites were screened at different time periods in the summer of 1995. Large differences were observed for lesion length among the 190 candidate trees, with some trees showing resistance comparable to the resistant checklot (PO-OSU-CF1), and others being no better than a low resistance checklot (OSU-HH). The highest-ranking parent trees (generally those comparable to PO-OSU-CF1 and/or with a lesion length less than 20 mm) were selected for placement into a breeding orchard.

In 1996, seedling offspring from 344 parents (and two bulk seedlots) selected for a common garden study (see Chapter 5) were screened for resistance. Each family was evaluated using two screening techniques: a stem dip method and a root dip method. Different seedlings from each family were used for the two inoculation methods; in general, 15 seedlings per family were inoculated. Families screened in 1996 represented random selections, and were generally not selected with disease resistance in mind.

Significant variation among families was found in the 1996 range-wide screening for both tests. Individual tree heritabilities (h_i^2) were very high using the root dip technique and fairly low using the stem dip technique. In addition, a low correlation between the two inoculation methods was noted. However, the frequencies of these types of resistance appear to be low in natural populations. Since the stem dip test allows for a more rapid assessment, it has been used for the initial phase of operational screening since 1997 with the contingency that the root dip test and/or field plantings will be used for selection validation and possible identification of other types of resistance. Two or three seedlings from 148 families representing the top 90 families from the stem dip test and top 90 families from the root dip test (an overlap did occur) were selected for placement into a breeding orchard.

Since 1997, more than 9,000 field selections have been screened using the stem dip technique. Approximately 10 percent of the candidates are being selected for placement into a breeding orchard. Results from the 1997 and 1998 screening showed that the high resistant checklot, PO-OSU-CF1, had a smaller lesion length (often considerably smaller) than the mean of the clones in each run for 70 of the 71 runs, the only exception being in Run 5 in 1998 where PO-OSU-CF1 had an abnormally high lesion length.

The lesion length of the best candidate tree in each run was often similar, or slightly less than for PO-OSU-CF1. In these runs, lesion length for the low resistant checklot, PO-OSU-CON1, was usually much larger than for the run mean, but often was less than the candidate tree with the largest lesion length. Within a run, there was generally

wide variation in branch lesion means among the clones in 1997 and 1998, with some outstanding clones for both high and low lesion length. From examination of the data collected in 1997 and 1998, no obvious geographic trend is notable for relative branch lesion length.

Appendix F

Field Validation Plantings of Potentially Resistant Port-Orford-Cedar

In 1993, two sites on the Siskiyou National Forest, known to have *Phytophthora lateralis*, were planted with one-year-old Port-Orford-cedar seedlings (Quosatana on the Gold Beach Ranger District and Flannigan on the Powers Ranger District). Twenty-eight seedling families (whose parents were screened in 1989/90), representing a range of resistance, were planted. Individual replications at each site encircled previously dead Port-Orford-cedar. Assessment of these plantings involves recording the presence of trees dead from *P. lateralis*. Survival in 1999 was 13 percent at Quosatana and 23 percent at Flannigan. Comparison of family means at the two sites showed some parents, such as 510015, with relatively good survival at both sites (31 percent at Quosatana, 53 percent at Flannigan), but some inconsistencies among other parents. Fifty percent of the mortality at the sites occurred within one year of out- planting, indicating that rapid field assessment of resistance may be possible. Variation in mortality among replications at a site indicates that microsite may play an important role. A remaining question that this early planting will help elucidate is how long will the best families from natural stands continue to show survival, and what percentage of the trees in these families survives.

Because Quosatana, on the Gold Beach Ranger District, was known to be a high hazard site for *P. lateralis*, a second validation planting was installed in 1996. This planting included a subset of the families screened at OSU in 1996. However, almost all of these seedlings died within a few months of planting. High early mortality was possibly due to a combination of factors including seedling stress and *P. lateralis* infection (a small sample of trees was evaluated by Dr. Everett Hansen at OSU and a high proportion of the trees were infected). Physiological stress was noted as evidenced by foliage scorching, sunburn or freeze-drying. Symptoms were most severe on the top side of the foliage.[27] No further assessments of the planting have been made, although observations at the site made while assessing other plantings have indicated that a proportion of the resistant checklots are still alive.

In 1998, 107 seedling families were planted at three sites: (1) Quosatana on the Gold Beach Ranger District, Siskiyou National Forest, (2) Camas Valley on the Bureau of Land Management (BLM) Roseburg District, and (3) the raised beds at Oregon State University. Two major categories of families were utilized in these plantings: (1) approximately 95 families that were screened in 1996 which were a subset of the families used in the common garden study and (2) families from control pollinations and open pollinated seed involving some of the more resistant parents tested. Examination of survival data indicates that, in general, there is not a strong correlation in family performance between the sites. Two methods of assessment were utilized for these three plantings and this may be one of the principal factors in the lower than expected correlation between family means. Depending upon the site, seedlings in some or all of the replications were pulled to examine disease progression. On the remaining replicates the seedlings were left and mortality was recorded. In general, it appears that the seedlings pulled for evaluation at the three sites, were pulled at relatively light (Quosatana), moderate (Camas Valley) and very heavy (OSU) levels of infestation. Several common families were highly ranked at all three sites, notably in the control pollination families. However, infestation levels at the OSU site were so high that few families stood out, while the infestation levels at the

[27] Hansen, E.M. 1996. Personal communication. Professor of Forest Pathology, Oregon State University, Department of Botany and Plant

time of examining roots at Quosatana may have been too low to allow full discrimination between families. Unknown at this time are how many (and which) resistance mechanisms may be present, and whether a variation in screening method or assessment method is needed to include families with different resistance mechanisms.

The Camas Valley site and the raised beds at OSU were utilized again in 1999 as planting sites. Two types of material were utilized in the plantings: (1) 29 seedling families from control pollinations and open pollinated seed involving some of the more resistant parents tested and (2) rooted cuttings of a number of parents selected from the 1997 operational screenings (20 clones for Camas Valley and 165 clones at OSU). Similar to the results from the 1998 planting, the survival data indicates that there is not a strong correlation in family performance between the sites. The level of infection and mortality at Camas Valley was much lower than that at OSU and probably too low to be able to distinguish family differences. However, significant differences between family means were detected for percent mortality at OSU. In addition, three small demonstration plantings, comparing rooted cuttings of the high resistant checklot PO-OSU-CFI to more susceptible seedlings and cuttings were established. The plantings will help validate some previous screening results and may provide some long-term evaluation of resistance.

Four sites were planted in 2000. The Camas Valley site and the OSU raised beds were planted again as well as new sites on the BLM Medford District (Bill Creek) and a site on private land in Hiouchi, California. As in 1999, two types of material were utilized in the plantings: (1) 108 seedling families from control pollinations and open pollinated seed involving some of the more resistant parents tested and (2) 128 rooted cuttings of a number of parents selected from the 1997 and 1998 operational screenings. Preliminary results indicate very strong differences among both seedling families and parents tested via rooted cuttings. Preliminary results from the root dip screening of the top ranking candidates from stem dip screening indicate that a moderate percentage of the initial selections may have resistance comparable to the high-resistant checklots.

Appendix G

Development of the Interagency Port-Orford-Cedar Root Disease Management Coordination Effort: A Brief History

Although individual National Forests and Ranger Districts had been instituting Port-Orford-cedar root disease management activities in their own areas for some years, there was no attempt to develop a coordinated effort for federal lands prior to the mid-1980s. In October 1985, the Western Natural Resources Law Clinic, representing the Northcoast Environmental Center, the Oregon Natural Resources Council, and the Oregon Native Plant Society expressed concern that the Forest Service was not protecting Port-Orford-cedar from root disease. The groups requested the establishment of an inter-regional committee, composed of Forest Service and citizen members, with authority to formulate binding Port-Orford-cedar root disease policy. In response to this request, the Forest Service met with the Western Natural Resources Law Clinic on January 21, 1986 to discuss their concerns about management of Port-Orford-cedar and its root disease. Following this meeting, the Western Natural Resources Law Clinic formed a Citizens' Panel in February 1986. The stated purposes of the Citizens' Panel were to develop recommendations for management standards and guidelines designed to protect Port-Orford-cedar from the spread of root disease, to preserve Port-Orford-cedar in its natural diversity throughout its native range, and to reestablish the commercial viability of the species.

In May 1987, an inter-regional Port-Orford-cedar Coordinating Group was formed by the Forest Service and Bureau of Land Management (BLM). The Coordinating Group was composed of a line officer, pathologists, ecologists, geneticists, representatives from the national forests with Port-Orford-cedar, and a representative of the BLM. The purpose of the group was to coordinate all activities affecting Port-Orford-cedar within and between Forest Service Regions 5 and 6 and the BLM. The Coordinating Group was charged with developing an action plan directed at the issues of highest concern (inventory, research needs, management, and public education). The Port-Orford-Cedar Action Plan was completed in 1988.

The Port-Orford-cedar program manager, an inter-regional Forest Service position, was added in 1989 to oversee the activities of the Port-Orford-cedar coordinating group. This full-time position was established to serve as a vital link in coordinating and completing the tasks listed in the Action Plan and to provide a lead person for evaluation and transfer of new technology as research findings become available for management of Port-Orford-cedar and its root disease.

In October 1994, the BLM issued the Port-Orford-Cedar Management Guidelines. The Guidelines contained management objectives, implementation strategies, measures for timber sale and service contracts to minimize spread of the pathogen, and specifications for equipment washing and cleaning. The intent of the Guidelines is to assist in retaining Port-Orford-cedar as a viable part of the forest ecosystem and to reduce the occurrence of the root disease. The BLM Guidelines recommended administrative procedures and best management practices, to be considered on a site-specific basis and analyzed in National Environmental Protection Act (NEPA) documents. In August, 1995, the BLM created and also filled a full-time Port-Orford-cedar Coordinator position.

From 1993 to 1998, several lawsuits were pursued by various environmental organizations, heightening the level of awareness of the Port-Orford-cedar issue within and outside of the federal agencies.

Environmental groups filed an action in January 1995 in the District Court in Northern California seeking declaratory and injunctive relief under NEPA and the National Forest Management Act against the Forest Service's Port-Orford-Cedar Action Plan and the BLM's Port-Orford-Cedar Management Guidelines. They sought an order enjoining the Forest Service and the BLM "to prepare a comprehensive, inter-regional environmental impact statement (EIS) on their management of the Port-Orford-cedar and its habitat" and, in the meantime, "to undertake all necessary actions to prevent the spread or introduction of *Phytophthora lateralis* and to maintain healthy diverse Port-Orford-cedar stands and habitat."

The U.S. District Court issued a decision in August 1996 agreeing with the government's argument that the plaintiffs cannot challenge under the Administrative Procedures Act (APA) government "programs" in general. The court found that the alleged "Port-Orford-cedar Program" was a term loosely applied to all the actions that the government took regarding managing Port-Orford-cedar including public education efforts, research, and sharing databases. Such a general program was not a "final agency action" reviewable under the APA.

As to the challenges to specific decisions such as the adoption of the BLM's Port-Orford-Cedar Management Guidelines in the BLM's Resource Management Plan decisions, the court found that the Guidelines merely contained possible control strategies for root diseases that managers may or may not select in subsequent site-specific NEPA decision processes.

The court concluded that since the Guidelines did not require land managing agency managers to take any action or make any specific proposal or commit any resources, it was reasonable for the government to determine that the Guidelines did not constitute a major federal action significantly affecting the quality of the human environment. The Ninth Circuit Court of Appeals affirmed this decision on appeal.

However, in Kern v. Bureau of Land Management, plaintiffs challenged an action which used the Guidelines, alleging that BLM failed to consider the impacts of the spread of *P. lateralis* in the Resource Management Plan EIS or in the Sandy-Remote Analysis Area Environmental Assessment. The plaintiffs also complained that the BLM failed to monitor and inventory the root rot disease or to control adverse effects posed by off-highway vehicle use. The U.S. District court of Oregon ruled that the BLM had adequately inventoried and analyzed the impacts on Port-Orford-cedar in the geographic area affected by the proposed project. In 2002, the Ninth Circuit reversed the lower court and ruled that when the programmatic EIS to which a project is tiered does not contain an adequate analysis of cumulative impacts of the adoption of the Guidelines in the programmatic decision, the tiering EA will also be inadequate if it does not include a cumulative impact analysis which would be sufficient for the programmatic level, even if the site specific analysis may have been sufficient for the particular watershed where the proposed action was located. As a result of this decision, the BLM and Forest Service administrative units in southwestern Oregon are preparing a supplemental environmental impact statement on the effects on the Port-Orford-cedar species from the management of the federal forests under the Northwest Forest Plan.

The Forest Service reviewed accomplishment of the tasks within the Action Plan in April 1995. The review determined that the majority of the items on the Action Plan had been accomplished or concluded and that ongoing items, such as monitoring, had been incorporated into individual forest plan management direction and forest-wide standards and guidelines. Based on these findings, the Forest Service found that the Action Plan

had been completed and could be concluded. The Regional Foresters accepted the recommendation and the Action Plan ceased to be operative May 16, 1995.

The Coordinating Group continues to function as a clearinghouse of information, to transfer technologies, and to coordinate range-wide activities dealing with Port-Orford-cedar. Two federal agency coordinators are responsible for disseminating information, coordinating activities to insure that protective measures are understood and used, educating the public on issues surrounding Port-Orford-cedar, and pursuing measures that will protect this species in its natural habitat.