Site Management Plan for Oregon Spotted Frog, (Rana pretiosa) at Sevenmile Creek, Klamath County, Oregon

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Interagency Special Status and Sensitive Species Program

Site Name:
Sevenmile Creek
Klamath County, Oregon
USDA Fremont-Winema National Forest
Klamath Ranger District

Common Name: Oregon Spotted Frog
Scientific Name: *Rana pretiosa*

Legal Description:
This site is located in Klamath County, Oregon, south of Crater Lake National Park and approximately 35 miles northwest of Klamath Falls.

Legal is T33S, R6E, sec 14 (Vicinity Map 1).

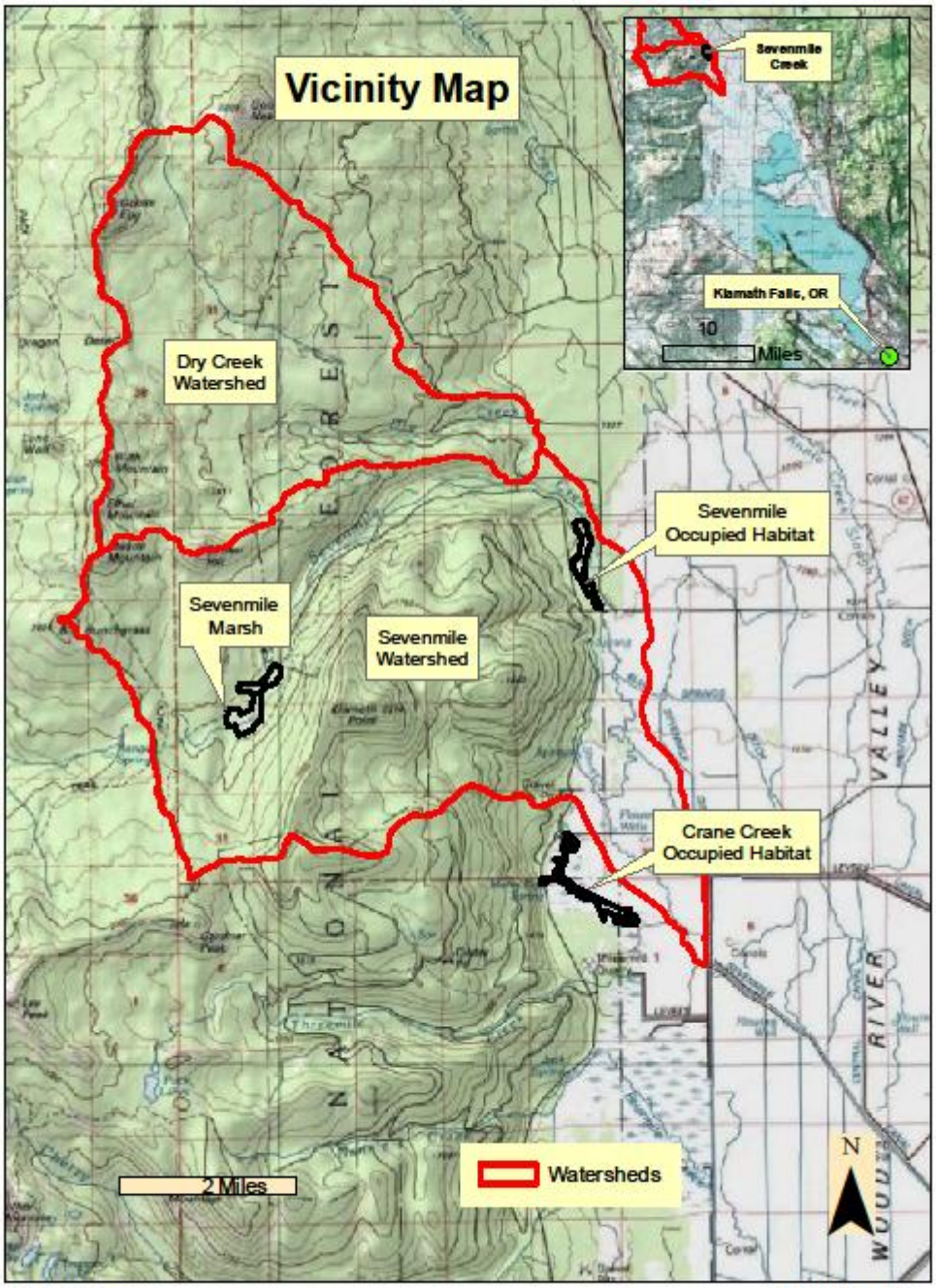
This site management plan (SMP) focuses on riparian habitats along approximately one mile of Sevenmile Creek. This site varies between 100-200 meters wide beginning on the south near Sevenmile Guard Station where the creek intersects the Nicholson Road and extending upstream and north for approximately one mile to the irrigation diversion structure for the Upper Sevenmile Ditch (Map 2). Land ownership is US Forest Service. Although this SMP may include site descriptions of the adjacent private lands, the recommendations for management actions included in this SMP primarily apply to US Forest Service lands only.

Goal of the Management Plan:
The goal of this site plan is to describe existing conditions and identify and recommend specific management actions that will restore or enhance habitat and/or populations of Oregon spotted frog.

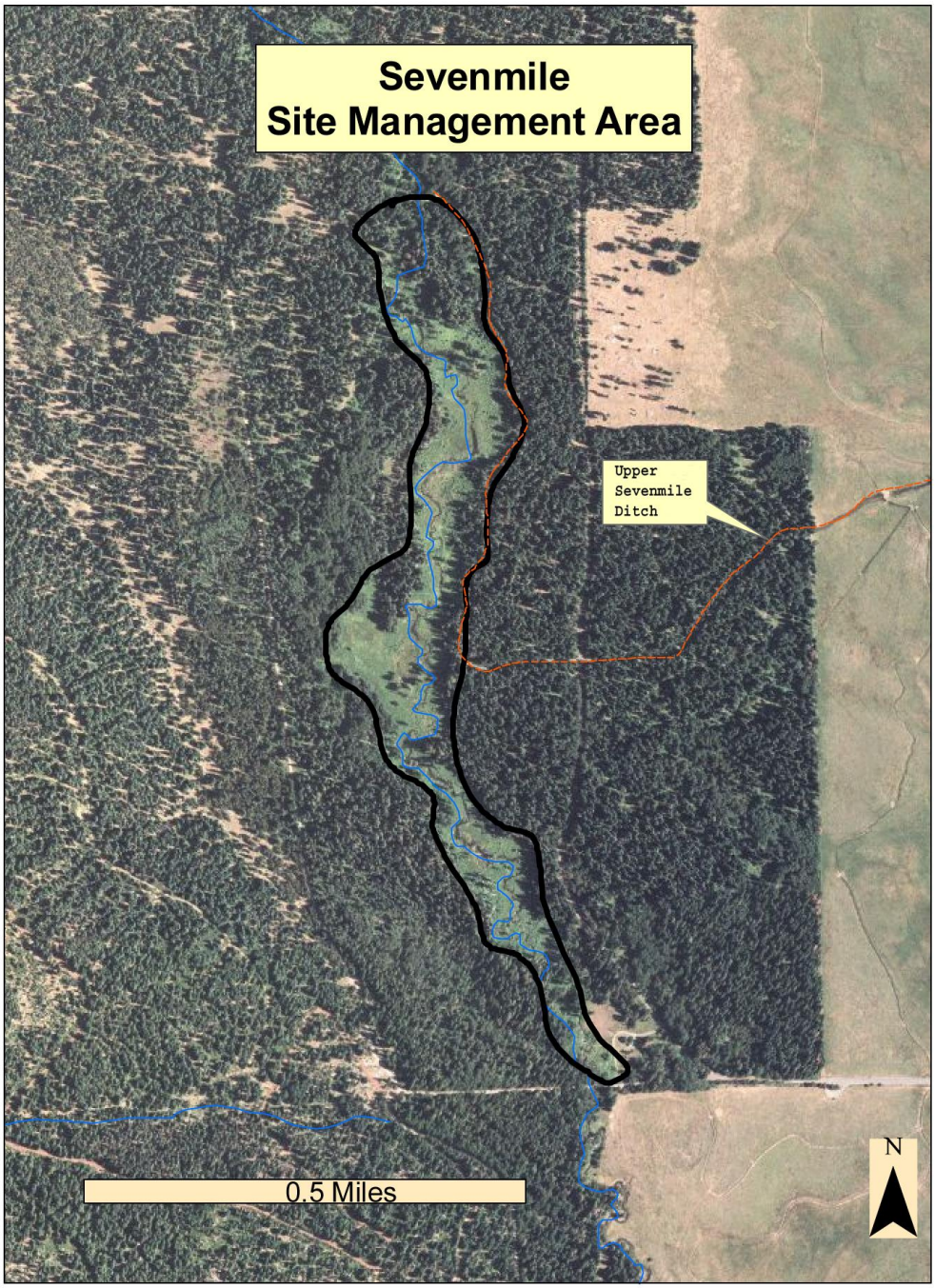
Primary direction and agency goals for management of Oregon spotted frog (OSF) in the Klamath Basin have recently been developed in an interagency *Conservation Agreement for the Oregon Spotted Frog (Rana pretiosa) in the Klamath Basin* (2010) where management objectives were stated as:

1. "to manage occupied habitat in a manner that sustains and /or restores its ability to support OSF populations,
2. to stabilize declining populations or increase populations within the Klamath Basin,
3. to reduce threats,
4. to increase distribution among available suitable habitats by restoring or creating habitat "

This Conservation Agreement also directs that Site Management Plans will be reviewed every five years to update new scientific findings or habitat information. This Site Management Plan (SMP) recommends specific management actions addressing these four objectives.



Map1 May 2011



Map 2 May 2011

Background

Cushman and Pearl (2007) have prepared a Conservation Assessment for the Oregon Spotted Frog that may be referenced for detailed descriptions of this species' live history, range-wide distribution, abundance, and trends. Additionally, as a Candidate species for listing under the Endangered Species Act, US Fish and Wildlife Service annually update their *Species Assessment and Listing Priority Assignment Form* (USFWS 2010) with the latest science, trend, and distribution information available. The recently completed *Conservation Agreement for the Oregon Spotted Frog (Rana pretiosa) in the Klamath Basin of Oregon* (2010) summarizes descriptions of Oregon spotted frog, habitat, life history, distribution, and current status in a concise narrative repeated here:

"A. Species Description
The Oregon spotted frog is the most aquatic ranid frog in western North America (Leonard et al. 1993). The back usually has black spots or rings with uneven edges and light centers (Leonard et al. 1993, Corkran and Thoms 1996). The belly and groin region display a mottled wash of red to orange in adults, but coloration in juveniles can be absent or occur over small portions of underside of thighs or groin (Hayes 1998). The eyes are upturned relative to other Northwestern native frogs, and the feet can be fully webbed (Corkran and Thoms 1996). Hind legs are relatively short compared to body length. Eggs are laid in fist-sized spherical masses containing 300 to 1500 embryos. Tadpoles are brown or gray with gold flecks, and the tail is about twice the body length (Leonard et al. 1993, Corkran and Thoms 1996).

B. Habitat Description
Oviposition sites tend to be close to shore in shallow water, and are usually positioned above vegetated, gently-sloped substrates (Pearl et al. 2009) Eggs are generally laid above sedges, grasses, and rushes in early spring before plant growth has begun (Pearl et al. 2009). Postbreeding habitats used by Oregon spotted frogs are typically aquatic, and often have areas of floating, emergent or subemergent vegetation that is near refuge that can be used to escape predators. One study in Oregon found that egg mass numbers were positively related to the presence of other Oregon spotted frog breeding sites nearby and the amount of emergent and subemergent vegetation coverage (Pearl et al. 2009). Habitats used during winter include flowing channels and springs (Shovlain 2005, Chelgren et al. 2008). Based on a telemetry study at one lowland site in western Washington, Watson et al. (2003) summarized seasonal requirements for Oregon spotted frogs as: 1) stable, shallow water for egg and tadpole survival in the breeding season; 2) deep, moderately vegetated pools for adult and juvenile survival in the dry season; and 3) shallow water levels over emergent vegetation for protecting all age classes during the cold weather in the wet season.

C. Life History
Oregon spotted frogs typically oviposit communally and these aggregations can contain eggs from 100 or more females in larger populations (Pearl et al. 2009). Communal oviposition may be linked to the female's affinity for depositing egg masses on top of previously laid egg masses (Licht 1969). Licht (1969) reported that initial breeding activity from one low elevation site in British Columbia began when air temperatures were at least 5° Celsius (41°Fahrenheit). However, the trigger for breeding is not well understood and is likely to vary geographically and

with elevation (C. Pearl, pers. comm.). High breeding site fidelity is suspected because oviposition often occurs within 0.5 m (20 in) of previous years locations (Licht 1969). Use of traditional oviposition sites that may have limited availability because of unique characteristics, and the possibility that adults may have limited flexibility to switch sites, makes the Oregon spotted frog particularly vulnerable to habitat changes at oviposition sites (Hayes 1994). Several aspects of the Oregon spotted frog's life history have been proposed as contributing to the species' vulnerability to habitat alterations (Hayes 1994, 1997, Watson et al. 2003, Pearl et al. 2004, Cushman and Pearl 2007, Pearl et al. 2009): 1) communal egg laying at sites used year after year restricts the number of reproductive sites; 2) the species' warm water requirement results in habitat overlap with introduced warm water fish; 3) the active season warm water requirement may limit suitable habitat in the cool climates of the Pacific Northwest; 4) the species may be vulnerable to the potential loss or alteration of springs used for overwintering; and 5) changes that increase deep, permanent water components are likely to favor establishment of non-native bullfrogs and fish, both of which may be detrimental to Oregon spotted frogs.

D. Distribution
The species is currently known from less than 50 population complexes in southwestern British Columbia, western and south-central Washington, and western, central, and south-central Oregon; no populations are known to persist in California (Cushman and Pearl 2007). Revisits of historic localities led Hayes (1997) to conclude that the species may be lost from 70 to 90% of its historic range. Most of the extant sites in the Klamath Basin are relatively higher in elevation and maintain the least altered hydrology (Hayes 1997). These sites also have the fewest exotic aquatic predators when compared to historic sites (Hayes 1997). In general, habitat modifications and aquatic predators have been more substantial at lower elevations than higher elevations, suggesting that either one or a combination may be responsible for the failure to record the species at lowland historical sites (Hayes 1997)."

Site Management History and Current Land Allocations:

The Land and Resource Management Plan (LRMP) for the Winema National Forest (1990) has designated USFS lands in this area as Management Area 3-Scenic Management and lands are managed to provide visually appealing scenery for the forest user. Timber harvest, grazing, and recreation activities are allowed within this management designation. Past timber harvest has occurred in the watershed, including within Sky Lakes Wilderness adjacent to Sevenmile Marsh prior to Wilderness designation. No recent (within 10-15 years) harvest has occurred and no impacts to flows or water quality are currently evident. No timber sales or fuels reduction projects are currently proposed in the watersheds. There are no grazing allotments in the area covered by this SMP.

The site management plan area is also within LRMP lands amended by the Northwest Forest Plan (1994) and subject to the Aquatic Conservation Strategy guidelines to restore and maintain the ecological health of watersheds and aquatic ecosystems. Sevenmile Creek was also recently designated Critical Habitat for bull trout (*Salvelinus confluentus*) (USFWS 2010b). Bull trout are not known to currently occur in Sevenmile Creek but any proposed restoration activities will necessarily need to consider bull trout habitat conservation measures.

An irrigation diversion is located at the northern, upper limit of the site management area and diverts water from Sevenmile Creek into the Upper Sevenmile Ditch for private agricultural irrigation purposes. Currently private water rights are permitted at times to divert 100% of creek flows from this diversion for agricultural purposes.

A USFS administrative site, Sevenmile Guard Station, is located at the southern end of the SMP area. Structures at this site include a cabin, garage, and pump house. Klamath Bird Observatory has used the site continuously since 1996 as one of the longest running bird monitoring stations in the area. They have used the cabin to house volunteer summer interns since 2002. The administrative site is also a designated stop on the Klamath Basin Birding Trail network of birding sites.

Site Description and Ecological Processes:

The Watershed Analysis Report for the Threemile, Sevenmile, and Dry Creek Watersheds (USFS 1995) may be referenced for detailed descriptions of these watersheds. Sevenmile and Dry Creek watersheds provide inflows to this SMP site. Dry Creek is a tributary of Sevenmile Creek and joins Sevenmile Creek approximately one mile above this site management area and Dry Creek flows are intermittent. Both streams originate entirely within the boundaries of the Klamath Ranger District of the Fremont-Winema National Forest at the crest of the southern Oregon Cascades, and flow east and south to the Klamath Lake Basin. Elevations range from 7,265 feet at the top of Klamath Point to 4,100 feet in the basin. The stream reach covered by this site management plan is at approximately 4,200 feet elevation. The combined watersheds contain 23,616 acres with flows from approximately 5,000 acres of the southern portion of the Sevenmile watershed entering Sevenmile Creek below this site management area. An irrigation diversion is located at the northern, upper limit of the site management area and diverts water from Sevenmile Creek into the Upper Sevenmile Ditch. Private lands along Sevenmile Creek have not been adequately surveyed for Oregon spotted frog and frogs have not been documented to occur there although connectivity to the Crane Creek and Sevenmile Creek populations may be possible.

The incidence of loose unconsolidated volcanics and pumice soils with high infiltration rates is greater in these two drainages than in any other basins in the vicinity. Small-scale systems with flow paths of less than a few miles and catchments of 1 to 10 mi^2, such as the Sevenmile Creek headwaters, fluctuate in response to present-year precipitation. Such features will have large discharge during wet years and small discharge during dry years (USGS 2010). This contributes to Sevenmile Creek having the lowest peak flow (50-70 cfs) of any creeks north of Pelican Butte. However, these high infiltration rates that tend to moderate peak flows also contribute to the highest base flows (15 cfs) per drainage area of streams in the vicinity.

Site Specific Species Range, Distribution, Abundance, and Trends:

Oregon spotted frog occurrence has been well documented in the lowest reaches of Sevenmile Creek where it merges with Crane Creek. These, possibly connected, populations of OSF were known to persist from Fourmile Creek, north to Crane, and Lower Sevenmile Creeks primarily

on private lands (Hayes 1998. Ross 2000). The OSF population along this upper, more forested reach of Sevenmile Creek on Forest Service lands was first discovered in 2006 when a survey on May 24 located three older egg masses which were hatching on that date (Pearl, pers. com). Documentation of subsequent surveys is not known until 2009 and 2010 when comprehensive repeated egg mass surveys were conducted along this stream reach (Table 1).

Surveys of the area from 2006 to present suggest there is one main site that is consistently used for OSF breeding and several other sites that are used inconsistently or by small numbers of frogs. All these sites have been associated with beaver dams. The bulk of the breeding has been documented at a large active beaver pond midway through the reach covered in this SMP. Surveys in 2009, 2010 and 2011 located a total of 33, 48, and 30 egg masses respectively. It is not valid to infer trends from only three years' data; however, these totals indicate OSF have been making use of the breeding habitat for the last several years, and that the site has potential to host a population that compares favorably in size to some other OSF breeding habitats in the Klamath Basin. The uppermost breeding site was lost during 2010 when the old beaver dam failed during the late winter and no breeding was recorded in the upper reaches of the site management area since 2009. Suitable OSF habitat is sparse or non-existent upstream of the SMP area for approximately six miles to Sevenmile Marsh in Sky Lakes Wilderness. Between the SMP area and the Marsh, the creek is steeper and more heavily forested, and lacks lentic habitat away from direct flow that could reach higher temperatures. Specific overwintering sites have not been investigated but are expected to be associated with the beaver dams near the breeding sites and Sevenmile creek itself which flows throughout the winter.

Sevenmile Marsh is a 40 acre diverse wetland which historically supported a beaver population. The remnant dams suggest there was once substantially more open, ponded water habitat favored by OSF. Beaver have not been present in the Marsh for an unknown number of years and the old large dams have overgrown and breached. Some open water remains in the marsh and vegetation consists of bog species such as sundews, bog buckbean, and sphagnum moss; aquatic species include pondweed, wocus, and bur-reed. Surveys of the Marsh area in the early 1990s (R Naumann, USFS) and late 2000's more recently (C. Pearl, 2008, USGS; L. Lerum, 2010, USFS) did not detect OSF. An unconfirmed sighting of OSF at Grass Lake in the Seven Lakes Basin of Sky lakes Wilderness by Dr. S. Cross or his students at Southern Oregon University has been reported but details have not been located. Grass Lake is in the headwaters of the Rogue River at 6000' elevation about three miles southwest of Sevenmile Marsh and would suggest that OSF did occur at some higher elevation sites. The marsh currently supports ranid populations of the Cascade frog (*Rana cascadae*), western toad (*Bufo boreas*), and Pacific chorus frog (*Pseudacris regilla*).

Site Threats:

Threats identified in the U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form last updated April 2010 listed: 'alteration of hydrologic function, non-native predaceous fish, vegetation succession, and grazing.' This document was addressing the much larger Sevenmile complex encompassing private lands south of this site management plan area of concern to Crane Creek.

Threats specific to the area addressed in this SMP include:

- Alteration of hydrologic function
- Loss of beaver and associated habitats
- Vegetation succession
- Isolation
- Non-native predaceous fish and bullfrogs
- Disease
- Climate change

Hydrologic Alterations:
Sevenmile Creek flows unimpeded from headwaters in Sky Lakes Wilderness to the Upper Sevenmile Ditch diversion which marks the upper limit of known OSF occurrence and this SMP area. This reach has a history of essentially being dewatered and in 1994 discharge measurements below the diversion showed a greater than 90% reduction in streamflow (USFS 1995). Current private water rights are permitted at times to divert 100% of creek flows at the Upper Sevenmile Ditch diversion for agricultural purposes. Seven years ago Klamath Basin Rangeland Trust (KBRT) secured a temporary lease from one of the water right holders for 4742 acre feet of water instream which serves to maintain and stabilize flows through the SMP reach. KBRT has reached agreement with the water right holder to permanently transfer these water rights instream, and is currently raising funds to complete the transaction. An adequate and stable flow of water through this reach of Sevenmile Creek is essential to maintaining beaver presence and resultant habitat modifications essential for OSF viability. Water management is likely the most immediate threat to this OSF population.

Loss of beaver and associated habitat:
This riparian OSF population is highly dependent on permanently or semi-permanently flooded shallows created by beaver impoundments. Beaver ponds also likely provide suitable overwintering sites for OSF. Beaver dams located centrally in this reach provide the primary breeding site for this population; this habitat supported 90% and 100% of the egg masses detected in the entire reach in 2010 and 2011, respectively. Two smaller dams approximately 400 meters downstream of this location were used in 2010 (5 egg masses); no egg masses were found there in 2011. Lower counts in 2011 may be related to deeper snows and a cool spring delaying snowmelt and water warming. A dam located near the upper end of the SMP area provided minor breeding habitat in 2009 (one egg mass) but that dam failed in 2010 and no breeding was documented in the upper half of the SMP area since that year.

Beaver are still present in the reach but at a reduced level from historic activity prior to the circa 1990's extensive dewatering. Minor dam maintenance and construction (Pearl, pers. com, 2011) has recently occurred. No evidence of overwintering beavers has been observed in several winter trips during 2009 – 2011 through the reach. Ample food supplies and dam building material appear to be present to support beaver. A reduction in beaver activity may be associated with past reduced water and/or stable flows through the reach. Predation or trapping pressure that may be affecting beaver numbers is unknown.

The loss of beaver presence and an adequate stable water supply are likely the most significant threats to persistence of this OSF population.

Vegetation Succession:
Threats due to vegetation succession are primarily related to a reduction in riparian flooding as a result of reduced flows and diminished beaver presence allowing the encroachment of confers. Conifer encroachment may contribute to a loss of habitat suitability due to shading and loss of open water habitat receiving solar exposure and warming.

Isolation:
For a highly aquatic species such as Oregon spotted frog, which breeds in specific wetland types and exists in a landscape often substantially altered from historic conditions, factors relating to isolation include: distance, permeability of habitat between source site and nearest breeding site, frequency of dispersal movements, and risks to/vulnerability of animals moving between potential breeding sites (*e.g*., exotic predators, culverts, water supply, etc.) (Cushman and Pearl 2007). Long distance movements by Oregon spotted frog appear to be infrequent and strongly linked to aquatic corridors (Cushman and Pearl 2007). Both Blouin et al (2010) and Funk et al. (2008) report low levels of within population genetic variation in Oregon spotted frogs. Low genetic variation may be attributed to small effective population sizes, historic or current genetic bottlenecks, and/or low among population gene flow (Funk el al. 2008, Blouin 2000).

Blouin et al. (2010) hypothesizes low connectivity among widely spaced OSF populations, rather than small population size, is the main reason for low genetic variation. They suggest that highly aquatic and patchy habitat is the obvious cause of this low connectivity. This study recommends that management actions should maintain connectivity between potentially connected populations and either expand or found additional populations to maintain diversity. This is probably best accomplished by improving, or expanding the available wetland habitats at each site .

The OSF populations at Sevenmile Creek are separated from the nearest known OSF breeding sites (Crane Creek) by approximately 2-3 miles (straight line distance). Connectivity to the Crane Creek population through wetted, likely migration corridors, would be a greater distance. Private land habitat along this corridor has not been adequately surveyed and it is not known if there is movement between these populations. An analysis of genetic samples collected from these populations to assess connectivity, isolation, and genetic bottlenecks is currently being conducted by USGS and Colorado State University.

Non-Native Fish and American Bullfrogs:
Non-native brook trout (*Salvelinus fontinalis*) occur in Sevenmile Creek. These trout are suspected to be predators of OSF tadpoles and small frogs (Hayes 1997, Pearl et al. 2009a). The reach has not been adequately surveyed to determine brook trout abundance or size so the significance of this threat is unknown though the potential exists. USFS fish surveys of Sevenmile Creek (2002) surveyed reaches above the Upper Sevenmile Ditch diversion and did not sample the SMP reach. Two redband trout (*Oncorhynchus mykiss*) fry recorded are suspected to be misidentified (N. Anderson, pers. com. 2011). All other fish sampled were brook trout with the largest being 185 mm. Few fish larger than 150 mm were sampled with most being between 30 and 100 mm. Observations during USFS OSF surveys in 2009 and 2010 detected no fish larger than approximately 200 mm. More thorough surveys of species, size, and abundance through and bracketing the SMP reach should be conducted to assess potential

impacts to this OSF population. Trout predation impacts on post-metamorphic OSF are not well understood, but interactions with OSF larvae and overwintering juvenile frogs are expected based on work with closely related Columbia spotted frogs (*R. luteiventris*).

Bullfrogs (*Rana catesbeiana*) are also a known predator of OSF (Hayes and Jennings 1986). Bullfrogs currently are not known to not occur in the SMP area, but they have established breeding at several sites downstream along Sevenmile Creek. Post-metamorphic bullfrogs have also recently colonized portions of Crane Creek on private lands 2.5 miles south of the SMP site. It is possible that bullfrogs occur closer than this on private lands that have not been surveyed. A USFS fish survey of Sevenmile Creek in 2002 notes a bullfrog observation two miles upstream. Neal Anderson, USFS Klamath Ranger District Fish Biologist assisting with that survey, stated the crew was not familiar with frogs and he now feels certain that this animal was misidentified and that this was likely a Cascade frog (*Rana cascadae*) which are abundant in that reach (pers. com. 2011). This OSF population is closely associated with riparian habitat along Sevenmile Creek with water temperatures cooler than more typical bullfrog habitat so this site may be only marginally suitable for bullfrog occupancy.

Disease:
Amphibians are susceptible to several diseases that may result in population losses either directly or as secondary stressors that reduce fitness and vigor in the population (Gray et al. 2009, Pearl et al. 2009, Petrisko et al. 2009). Chytridiomycosis is a disease of amphibians that is caused by the fungal pathogen *Batrachochytrium dendrobatidis* (Bd). Testing has shown that the pathogen is present in Klamath Basin OSF populations, including nearby Crane Creek; the Sevenmile Creek OSF population was not specifically sampled (Pearl et al. 2009b). OSF infected with Bd in a laboratory setting were able to clear the infections with no mortality suggesting some resistance to Bd (Padgett-Flohr and Hayes 2011). Test animals came from a population that had previously been declining and it was suggested that these animals may have previously developed some resistance to the disease and further testing from a population that had not previously been declining was recommended. OSF also possess diverse antimicrobial peptides that may help mitigate effects of dermal pathogens like Bd (Rollins-Smith, et al. 2005). The combination of field data and lab data imply that Bd is not currently a primary driver of declines, although factors that mediate its effects are not completely fully understood.

Viral pathogens of the genus *Ranavirus* have been responsible for recent widespread amphibian population die-offs and may be an interaction of suppressed and naïve host immunity, anthropogenic stressors, and novel strain introduction (Gray et al. 2009). Water-molds of the family Saprolegniaceae are broadly found on decaying organic debris and have been implicated in mortality of eggs of other amphibians. These oomycetes have been found on eggs of several pond breeding amphibians in the Northwest, including OSF in the Klamath Basin (Petrisko et al. 2008). Presence or significance has not been studied at Sevenmile Creek.

Climate Change:
Climate change is expected to significantly affect water resources in the western United States by the mid 21st century (Barnett et al., 2008). Climate change is generally predicted to result in increased air and water temperatures, decreased water quality, increased evaporation rates, increased proportion of precipitation as rain instead of snow, earlier and shorter runoff seasons,

and increased variability in precipitation patterns (Adams and Peck 2002). These changes in precipitation amounts and timing are expected to increase the occurrence of localized drought. Higher temperatures may also lead to earlier and more rapid surface water runoff flooding in the spring. Both drought and flooding can negatively impact Oregon spotted frogs in all life cycles, particularly in isolated populations occupying fragmented habitat.

Seasonal drought affects populations by increasing the likelihood of egg mass desiccation and exposure to freezing, concentrating post-metamorphs thus elevating predation risk, and increasing the impacts of localized events (Licht 1974 and 1975, Hayes 1997*b*, Kiesecker and Blaustein 1997). Multiple year droughts carry impacts similar to seasonal droughts, but may expose populations to negative long term impacts including decreased population numbers, potential losses in population heterozygosity, exacerbation of impacts from catastrophic events, and potential extirpation (which is more serious in isolated populations and metapopulations with remote chances of being recolonized).

Changes in water levels due to localized drought can cause seasonal loss of habitat and degradation of essential shoreline vegetation. Hayes (1997) assessed 38 percent Oregon spotted frog sites as having a moderate to high risk from drought (i.e. the potential for a drop in water level that could reduce or eliminate the species' habitat). Sites with the greatest risk included sites depending on surface flow rather than flows from springs and having low precipitation levels. According to this qualitative assessment, sites ranked as having greatest risk from drought are in Oregon in the Klamath and Deschutes Basins (Hayes 1997). Other sites at risk from fluctuations in water levels include those that are beaver dependent, those that depend upon overbank flow from rivers and streams, sites related to irrigation systems, and sites dependent upon immigrations from nearby habitat.

Warmer temperatures may result in more precipitation falling as rain and a reduction in winter snowpack with earlier melting in the spring (Mote et al. 2003). An increase in rain-on-snow events will likely increase the frequency and severity of flooding. Changes in the severity and/or timing of spring floods could threaten breeding sites by washing away egg masses which has occurred at some Deschutes sites (C. Pearl pers. com.). OSF populations dependent upon beaver dams creating habitat are also at risk if dams are washed away. This occurred in 2010 at the upper breeding site in the SMP reach with the loss of the beaver dam creating shallow pond edge breeding habitat.

These long term climate changes and local drought would serve to reduce water flows and levels potentially reducing habitat suitability for OSF. Basins on the eastern flank of the Cascade Range are unique in that ground water discharge composes a large proportion of the total stream flow. This is attributable to the substantial regional ground water system that exists in the permeable volcanic terrane. Variation in Sevenmile seasonal flows are somewhat tempered due to infiltration of precipitation and snowmelt into the porous volcanic soils. However, ground water contributions are much more important to Sevenmile Creek flows below the SMP area were numerous springs provide water to the stream. Ground water contributions to flows in Sevenmile Creek above the SMP reach were estimated to be 18 cfs +/- 20% and 60 cfs +/- 20% below the reach (USGS 2010). Extended reductions in precipitation necessary to recharge groundwater would likely reduce base flows in Sevenmile Creek and compound negative

impacts currently experienced as a result of water diversion and loss of beaver dams contributing to open water breeding habitat. Hood and Bailey (2008) found that beaver were much more important than temperature, precipitation and climatic variables in maintaining open water areas important to OSF. They found that during wet and dry years, the presence of beaver was associated with a 9-fold increase in open water area when compared to a period when beaver were absent from those same sites. The presence of beaver at sites like Sevenmile Creek can have a dramatic influence on the creation and maintenance of wetlands even during extreme drought. Monitoring of water level fluctuation at Sevenmile beaver ponds is currently being conducted by USGS (C. Pearl, pers. com.) and should provide needed baseline data to assess changes due to weather changes and water diversion and impacts to this OSF population.

Management Needs

Desired Site Conditions:
The desired site condition for the Sevenmile OSF site is an increase in suitable habitat allowing greater distribution and abundance of animals.

The first priority for this population should be to maintain the existing conditions and protect habitat conditions that are providing for a seemingly stable population of OSF to persist. This may best be achieved by initially maintaining adequate and stable water flows which would encourage continued beaver occupancy and dam maintenance. The presence of beaver created habitat in this system is essential to the continued viability of this OSF population. Once this is secured, or concurrently if means are available, efforts may then be extended to restore and enhance conditions that allow for population growth and distribution expansion. Given the important role of beaver in wetland preservation and in light of a drying climate in this region, their removal should be considered a wetland disturbance that should be avoided. Hood and Bayley (2008) argue that removing beavers should be recognized as a form of wetland degradation comparable to infilling and draining. Beaver importance to general watershed health and specifically to the Sevenmile Creek OSF population provides compelling reasons for the conservation and reintroduction of beavers into areas where populations have been reduced or extirpated.

Other threats to OSF may then be addressed to build resiliency into the habitat and population so that temporary adverse conditions do not place the viability of the population at risk.

Suggested Management Actions are summarized in Table 1 below:

Table 1. Suggested Management Actions

Action Needed	Timeline	Threat	Activity Location	Desired Site Condition
Maintain adequate and stable water flow by working with KBRT to secure long term lease or purchase of water rights.	ongoing	Hydrologic function	Upper Sevenmile Ditch Diversion	Restored historic water supply and hydrologic function. Restored beaver and OSF habitat.

Education of site users to population presence, sensitivity, and protection measures. Primarily requests to clean equipment and not walk over and degrade beaver dams	ongoing	Habitat alteration	Primarily onsite to reach known site users (Agency, Klamath Bird Observatory. personnel, fishermen and birders	Old beaver dams remain functional and diseases and invasive species are not introduced.
Enhance beaver abundance and viability by securing stable water and possible introductions if study shows feasible. Consider re-establishing beaver to Sevenmile Marsh	2012	Loss of beaver	Throughout Sevenmile watershed	Restored beaver and OSF habitat.
Remove encroaching conifer into wetlands. Target low gradient areas that may provide future shallow flooded areas.	2013	Vegetative Succession	Throughout SMP area	Restore and increase suitable frog habitat
Monitor and assess nonnative predator impacts. Initiate control measures of bullfrog as needed. Complete thorough fish survey for species, abundance, and size throughout the watershed.	2012-2013	Non-native Predators	Throughout SMP area	Non-native predators do not impact OSF viability
Support research to assess population impacts related to amphibian diseases. Sterilize field equipment between sites	2011	Disease	All OSF habitats	Eliminate or minimize human related transmission vectors.
Research to identify what specific habitat or landscape features enhance or discourage movement among populations.				
All actions above to restore and enhance habitats and reduce viability stressors	ongoing	Climate Change	Throughout SMP and potential range expansion areas	Increase population resiliency to reduce effects of climate change related stressors.
Monitor habitat and population changes by continuing egg mass surveys and monitoring water levels and beaver dam condition.	Annually.	All Threats	SMP area	Changes are detected and adaptive management actions taken as needed.
Update Site Management Plan as directed in Interagency Conservation Agreement	2016 or sooner if warranted	All Threats	Sevenmile SMP	Incorporate new science findings and habitat information every five years

Actions Needed:

Hydrologic Function: Stream flows in Sevenmile Creek are considered to be naturally among the most stable in Klamath Basin watersheds (USFS 1995). Long term (over 10 years) stream gauge data for this watershed could not be located. A SNOTEL station located at Sevenmile Marsh likely provides the best data for this system (Appendix 2) and displays significant yearly variation in water supply to this watershed. Hydrologic function at the Sevenmile site has been and is currently impacted by private water diversion at the Upper Sevenmile Ditch. Current private water rights allow at times 100% of the Sevenmile Creek flow to be removed from this diversion at the upper boundary of this SMP area and upper limit of known OSF occupancy. When this has occurred in the past this reach through the SMP area has been essentially dewatered severely degrading it's suitability as OSF and beaver habitat. For the past seven years, Klamath Basin Rangeland Trust has negotiated a temporary lease of water which has allowed stable year-round flows and is currently leading efforts to secure funds to extend this as a long term lease or permanently purchase water rights to ensure stable water flow through this Sevenmile reach (S. Peterson, pers. com.). Secure stable water flows through this reach is likely the most immediate and significant threat to this population. Support of this effort, which would secure habitat and improve connectivity for OSF and native fish in the watershed is the first management priority for this population.

Education: Unintentional habitat degradation or exotic species or disease introduction may result from people accessing the area. This site is a designated stop on the Klamath Basin Birding Trail which likely increases human visits and the area also attracts some use by fishermen. The USFS Sevenmile Guard Station is occupied by Klamath Bird Observatory (KBO) personnel all summer and is the location of the longest operating bird monitoring station in the Basin. Potential adverse impacts to the frog population may inadvertently occur related to disturbance of frogs and beaver, vector for amphibian disease transmission, habitat modifications associated with user built trail construction, and, probably most significant, human foot travel over beaver dams leading to damage and breaches affecting water levels at breeding sites associated with the dams.

Efforts have been made to discuss potential impacts to OSF with KBO personnel at the Guard Station and they have agreed to minimize impacts related to their presence by not crossing over the fragile old beaver dams. Outreach to the Klamath Birding Trail users and fishermen should be considered as well as better inter and intra agency personnel education. Visitors may also be enlisted to assist with monitoring for the spread of bullfrogs in the area. Informational signs could be placed in the area with contact information so that birders, fishermen, or other visitors could report observations.

Beaver: Beaver were historically more active through this reach as evident from USFS Sevenmile stream surveys conducted in 1991, 1994, and 2002 (USFS) when this SMP reach was classified as a marsh and stream measurements not taken. In 1994 it was estimated that 90% of instream flows were being diverted which reduced habitat suitability for beaver likely leading to degradation and loss of OSF habitat, although OSF had not been identified at the site at that time. With current more stable flows during recent years beaver are again active and beginning to restore dams. It is unknown how many beaver the site may support and whether they will

naturally increase to restore existing conditions. The Oregon Department of Fish and Wildlife (ODFW) publication, *Guidelines for Relocation of Beaver in Oregon* (accessed 1/4/2012 at http://www.dfw.state.or.us/wildlife/living_with/docs/Guidelines_for_Relocation_of_Beaver_in_Oregon.pdf) does not allow moving beaver into existing occupied habitat so it is unlikely that beaver could be moved into the SMP reach as long as there is current evidence of beaver in the reach. Adequate vegetation for food and dam building appear available.

Shallow open water habitat is limited through the upper Sevenmile Creek area and any creation of additional sites would likely increase OSF breeding opportunity and success. An increased beaver population might move upstream into the adjacent low gradient forested stream reach and build dams at some historic abandoned sites. This would serve to create additional flooded areas and may expand suitable OSF habitat. Beaver could also repopulate or be reintroduced into Sevenmile Marsh and restore the extensive marsh conditions that historically existed there. Beaver habitat conditions should be investigated and if deemed appropriate relocation of beaver into Sevenmile Marsh might be pursued. Sevenmile Marsh may meet ODFW guidelines for beaver introduction although current conditions may not provide the required vegetation component required. If attempts to enhance beaver populations are not successful the repair of decadent dams or artificial creation of shallow water areas might be considered. USGS is beginning to study beaver/OSF relationships and Sevenmile Creek has been selected as one of the study sites for water level and egg mass monitoring.

Vegetative succession: Limited riparian conifer removal along this SMP reach could expand and improve OSF habitat potential. Specific locations for vegetation treatments should be selected to maximize solar gain at low gradient sites that could be flooded by beaver or alternatively by constructed low dams to simulate beaver modifications if future study determined appropriate. Currently, introduced non-native plants are not an issue at this site.

Isolation: Support for the ongoing USGS genetic connectivity study should continue which would help determine if or how long ago connectivity existed. If, as suspected, connectivity does not currently exist, restoring connectivity between Sevenmile and Crane Creek populations would require participation by private landowners to remove connectivity barriers and restore and enhance habitats suitable for OSF. Initially efforts should be made to secure access to survey and assess habitat conditions, barriers, and OSF and predator presence. Based upon the results of these surveys future efforts could then focus on removing barriers and enhancing OSF habitat to establish connectivity.

Non-native predators: Although brook trout are abundant throughout Sevenmile Creek, large fish have not been observed in significant numbers. Since brook trout and OSF are both associated with beaver dam ponds there may be some predation and negative impacts but significance is unknown at this time. Bullfrogs currently are not known to occur at this site but are established on private lands downstream. Continued monitoring for the presence of bullfrogs should be conducted so that early detection and rapid response control measures might be implemented if needed. Prevention measures such as education of private landowners and public to prevent introductions of non-native species might be pursued. Ongoing efforts with downstream property owners to acquire access to survey and implement bullfrog control efforts should continue.

Native predators on site (otters, cranes, herons, mink, raccoon, etc.) may also contribute to population declines and impacts might best be minimized by improving and restoring natural habitat thereby improving the health and abundance of the OSF population so that it may absorb these losses.

Diseases: Until further research is conducted to clarify the relationship between amphibian diseases and the localized importance in OSF mortality and potential links to population decline, current management efforts should continue to focus on reducing the vectors that might introduce or transfer these pathogens between populations. Ongoing efforts to sterilize waders and equipment used by surveyors and researchers should continue.

Climate Change: Local actions are unlikely to have significant effects on climate change but can serve to minimize or mitigate negative effects. Any and all actions to improve habitat suitability and to increase populations will build resiliency into the population so that stressors related to climate change may be minimized.

Monitoring: Continued ongoing efforts to monitor this population through egg mass surveys, water level flux, and beaver presence and dam condition monitoring should continue to detect changes that adaptive management actions may address to reduce overall threats to this population. A staff gauge is in place at the Upper Sevenmile Ditch Diversion but is not currently being monitored throughout the year. Efforts to establish a permanent stream flow gauge to measure flows through the SMP reach would be beneficial for future management decisions and project design. This will necessarily be an interagency effort but may best be completed with a designated lead agency to coordinate and document for this site. Since OSF has ESA Candidate status, USFWS is compiling all known OSF data yearly to update their species assessment and listing priority assignment.

Update Site Management Plan: Conservation Agreement for the Oregon Spotted Frog (*Rana pretiosa*) in the Klamath Basin of Oregon (2011) directs that Site Management Plans will be updated every five years to incorporate new science or habitat information. It may be necessary to update this plan sooner as current ongoing research findings become available that could drive some management actions.

Adaptive Management

Monitoring/Site Revisits and Adaptive Management:

- Sevenmile Creek has been visited and some level of survey or study conducted in 2006 and 2009-11. Surveys focused on egg mass searches with increasing levels of effort. Due to inconsistent survey attention and short time frame since discovery of this population, trends in OSF at Sevenmile are unknown. Egg mass surveys continue to be conducted. The site is also included in a USGS ARMI Mid-Level monitoring study of OSF population status in Oregon.

- Researchers from Colorado State University and USGS are conducting a genetic analysis to assess isolation and connectivity among Klamath Basin OSF populations, including Sevenmile Creek.
- USGS is also beginning a study of relationships between beaver and OSF. Part of that study in 2011 was to monitor water levels and egg survival at Sevenmile and other sites. There may be other opportunities to tie the Sevenmile Creek site in with that study.
- No restoration projects are currently being proposed given current reduced funding and workforce capacity. Beaver enhancement projects should be pursued.
- The Forest Service and USGS are currently working with the private landowner below the SMP area for access to survey and initiate bullfrog control measures.
- Habitat conditions along Sevenmile Creek should be monitored annually to detect changes in beaver and beaver created OSF habitat.

Monitoring and management actions are summarized in Table 2 below:

Table 2. Monitoring and Actions

DATE	PERSONNEL	MANAGEMENT ACTION OR SITE REVISIT	RESULTS OR OBSERVATION	ADDITIONAL COMMENTS
1995	Hamilton BLM	Observation of OSF downstream at Fourmile Creek	About 3 adults	Westside Klamath Basin OSF presence first documented
2002	Klamath Basin Rangeland Trust (KBRT)	Seven year lease of water right to maintain flow in Sevenmile Creek	Beaver utilizing area again and maintaining dams	OSF presence not documented at this time
2006	Pearl USGS	Egg mass surveys	3 egg masses in a partial survey	Population discovered in upper Sevenmile
2009	Lerum USFS	Egg mass surveys	33 egg masses	4+ visits
2010	Lerum USFS Pearl USGS	Egg mass surveys	48 egg masses	6+ visits
2010	Pearl USGS Lerum USFS	Genetic samples collected	Ongoing analysis	May be completed in 2012
2010	KBRT	Continues to lead efforts for long term lease or purchase of water rights	Ongoing effort to maintain flows in Sevenmile Creek	
2011	Pearl USGS	Egg mass surveys	30 egg masses	Heavy snowpack and cold spring leading to late breeding

2011	Pearl USGS	OSF/beaver relationship study	Ongoing	Included water level flux monitoring in 2011. Potential for additional study.
2011	Lerum USFS	Site Management Plan		

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Appendix 1. Sevenmile Creek --Typical Habitat Photos

Appendix 2

1987-2011 Snotel Station OR22G33, Sevenmile Marsh

Average Air Temperature in Degrees C

1987		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	yr ave.
	mean	7	1	-1	1	-1	0	6	8	13	12	16	14	6
	max	14	9	3	12	4	7	13	16	21	23	20	21	14
	min	0	-4	-4	-11	-6	-5	-4	-1	1	2	8	5	-2
1988		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	11	1	-4	-3	1	0	3	4	10	16	16	12	6
	max	18	7	4	3	7	7	11	15	18	23	21	24	13
	min	6	-5	-9	-9	-8	-6	-3	-5	0	6	10	3	-2
1989		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	11	-1	-2	-3	-6	0	5	5	12	13	13	12	5
	max	17	9	6	5	0	3	11	12	16	18	19	16	11
	min	6	-7	-11	-12	-20	-8	-2	-2	5	-6	5	4	-4
1990		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	6	2	1	-2	-3	1	6	5	10	16	15	13	6
	max	15	8	5	3	5	6	12	15	20	23	23	19	13
	min	-4	-5	-6	-7	-13	-7	-1	0	-1	5	7	7	-2
1991		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	0	-7	-1	2	-2	1	4	8	16	16	15	5
	max	16	8	2	3	5	6	5	9	16	22	19	20	11
	min	-1	-6	-25	-5	-2	-7	-6	-2	4	10	9	9	-2
1992		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	9	1	-1	-1	1	3	5	11	13	15	17	12	7
	max	17	8	3	3	6	7	11	18	23	23	24	18	13
	min	-5	-7	-6	-6	-4	-1	-3	2	1	6	7	4	-1
1993		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	8	0	-4	-5	-4	2	1	6	9	11	13	13	4
	max	16	8	0	2	1	6	6	12	18	16	21	20	11
	min	0	-6	-8	-10	-15	-2	-3	-1	1	6	6	4	-2
1994		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	7	-1	-2	-1	-3	2	3	7	10	18	15	13	6

	max	17	5	3	5	0	8	10	15	19	24	21	20	12
	min	1	-10	-8	-5	-8	-8	-1	1	1	8	10	4	-1
1995		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	-4	-4	-2	2	-1	1	6	9	14	13	13	4
	max	12	5	3	4	7	5	9	15	18	20	20	20	12
	min	-1	-10	-11	-8	-9	-6	-5	0	-1	6	0	3	-4
1996		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	6	3	-1	-2	-1	1	2	5	11	18	17	10	6
	max	11	8	5	5	6	7	11	12	18	23	23	17	12
	min	-1	-2	-8	-8	-11	-5	-3	-2	4	5	9	2	-2
1997		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	6	1	-2	-3	-2	1	1	9	9	15	15	11	5
	max	18	7	2	4	4	8	10	14	16	20	21	16	12
	min	-4	-4	-7	-14	-5	-6	-6	0	4	4	10	4	-2
1998		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	1	-3	-2	-2	0	2	3	10	17	17	14	5
	max	13	9	2	2	0	6	11	10	16	22	24	23	12
	min	-1	-2	-8	-6	-4	-6	-4	-1	4	12	11	5	0
1999		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	-1	-4	-2	-4	-2	1	5	9	15	14	13	4
	max	15	2	4	3	0	6	9	14	15	22	20	17	11
	min	-1	-5	-19	-8	-9	-8	-7	-2	0	5	3	3	-4
2000		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	8	2	-1	-3	-1	0	4	6	13	14	16	11	6
	max	14	7	3	0	2	5	10	14	19	21	21	18	11
	min	0	-5	-6	-7	-5	-5	-2	-3	2	6	10	2	-1
2001		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	-1	-1	-4	-3	1	0	10	10	15	17	13	5
	max	14	4	4	0	3	7	11	18	18	21	23	17	12
	min	-1	-7	-6	-9	-9	-6	-6	-1	2	9	9	6	-2
2002		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	8	1	-3	-4	-1	-1	4	6	12	18	15	13	6
	max	17	6	1	3	4	8	9	13	20	25	22	19	12
	min	-2	-8	-6	-11	-5	-8	-4	0	1	12	6	3	-2

2003		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	6	2	-1	1	-2	0	0	6	14	18	16	14	6
	max	13	6	3	6	5	8	5	15	21	25	22	21	13
	min	-6	-5	-7	-4	-6	-4	-6	-1	5	12	11	3	-1
2004		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	8	-2	-2	-2	-2	3	4	6	11	17	16	10	6
	max	14	1	2	1	0	9	12	11	17	23	22	17	11
	min	-5	-8	-8	-7	-5	-3	-2	0	2	12	7	1	-1
2005		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	0	-1	-2	-1	2	1	6	8	18	17	10	5
	max	13	8	4	5	5	8	8	16	15	23	22	17	12
	min	-2	-8	-4	-8	-5	-3	-5	0	0	10	8	2	-1
2006		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	1	-2	-2	-2	-4	0	5	11	16	14	11	4
	max	14	6	3	2	4	1	8	13	21	22	18	17	11
	min	-1	-6	-7	-7	-12	-10	-6	-2	4	8	8	2	-2
2007		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	7	1	-1	-2	0	3	3	8	11	16	15	11	6
	max	13	10	4	4	6	8	10	16	16	22	21	18	12
	min	-1	-8	-8	-12	-6	-6	-3	0	1	10	9	2	-2
2008		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	4	3	-3	-4	-1	-1	1	6	10	16	15	13	5
	max	10	9	4	1	4	4	9	15	20	20	23	20	12
	min	-1	-4	-7	-10	-5	-7	-6	-2	1	13	10	4	-1
2009		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	7	4	-2	1	-1	-1	2	7	10	17	15	14	6
	max	16	10	6	7	5	5	12	15	17	22	22	19	13
	min	-2	-2	-12	-9	-6	-7	-5	1	4	9	6	1	-2
2010		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	5	1	-3	0	0	1	1	3	9	16	15	11	5
	max	10	8	3	5	3	6	7	9	15	20	21	18	10
	min	-3	-4	-14	-3	-4	-6	-3	-2	3	6	6	5	-2
2011		oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	
	mean	7	0	-1	0	-1	-1	1	4	8	13	16	14	5

	max	17	9	4	6	5	5	7	8	14	18	18	19	11
	min	-1	-9	-8	-11	-10	-3	-5	0	1	9	12	8	-1

http://www.wcc.nrcs.usda.gov/ftpref/data/climate/table/temperature/history/oregon/22g33s_tavg.txt

1987-2009 SNOTEL Station OR22G33, Sevenmile Marsh

Snow Water Equivalents in inches

	year	date	swe	date	swe	date	swe	date	swe	date	swe	date	swe
	1981	1-Jan	5.7	1-Feb	6.2	1-Mar	9.2	1-Apr	14.6	1-May	2.5	1-Jun	0
	1982	1-Jan	22.6	1-Feb	34.3	1-Mar	36.5	1-Apr	40.9	1-May	39.9	1-Jun	7
	1983	1-Jan	17.1	1-Feb	25.9	1-Mar	37.5	1-Apr	51.3	1-May	21.6	1-Jun	0
	1984	1-Jan	25	1-Feb	29.4	1-Mar	36.8	1-Apr	43.6	1-May	46.6	1-Jun	27.4
	1985	1-Jan	23.5	1-Feb	25	1-Mar	32.7	1-Apr	41	1-May	25.1	1-Jun	0
	1986	1-Jan	12.5	1-Feb	18.6	1-Mar	30.1	1-Apr	32.2	1-May	23.3	1-Jun	0
	1987	1-Jan	8.9	1-Feb	15.9	1-Mar	23	1-Apr	26.3	1-May	4	1-Jun	0
	1988	1-Jan	9.2	1-Feb	18.3	1-Mar	17.1	1-Apr	15.7	1-May	1.7	1-Jun	0
	1989	1-Jan	18.5	1-Feb	30.9	1-Mar	39.7	1-Apr	48.5	1-May	35.7	1-Jun	4.9
	1990	1-Jan	0.8	1-Feb	7	1-Mar	16.3	1-Apr	13.7	1-May	0	1-Jun	0
	1991	1-Jan	6.9	1-Feb	7.9	1-Mar	9.4	1-Apr	16.6	1-May	18.7	1-Jun	0
	1992	1-Jan	6.9	1-Feb	11.6	1-Mar	13.6	1-Apr	5.9	1-May	0.6	1-Jun	0
	1993	1-Jan	16.8	1-Feb	30.1	1-Mar	38.1	1-Apr	36	1-May	36.6	1-Jun	7.3
	1994	1-Jan	8.3	1-Feb	13.7	1-Mar	20.9	1-Apr	17.8	1-May	9.1	1-Jun	0
	1995	1-Jan	16.5	1-Feb	25.2	1-Mar	24.7	1-Apr	30.7	1-May	29.9	1-Jun	3.7
	1996	1-Jan	3.2	1-Feb	19.9	1-Mar	26.7	1-Apr	28.6	1-May	21.1	1-Jun	0
	1997	1-Jan	21	1-Feb	28.2	1-Mar	31.9	1-Apr	32.8	1-May	27.1	1-Jun	0
	1998	1-Jan	7.4	1-Feb	19.9	1-Mar	33	1-Apr	34.1	1-May	29.4	1-Jun	23
	1999	1-Jan	18.1	1-Feb	24.5	1-Mar	41.1	1-Apr	47.8	1-May	43.6	1-Jun	22.7
	2000	1-Jan	6.9	1-Feb	23.9	1-Mar	31.4	1-Apr	31.5	1-May	20.2	1-Jun	0
	2001	1-Jan	7.4	1-Feb	10.4	1-Mar	13.7	1-Apr	9.8	1-May	5.8	1-Jun	0

	2002	1-Jan	21.2	1-Feb	27.1	1-Mar	33.4	1-Apr	38.3	1-May	25.5	1-Jun	0
	2003	1-Jan	13.7	1-Feb	13.8	1-Mar	16.7	1-Apr	20.9	1-May	25.7	1-Jun	2.4
	2004	1-Jan	18.6	1-Feb	31.2	1-Mar	42.1	1-Apr	38.1	1-May	27.5	1-Jun	1.6
	2005	1-Jan	7.2	1-Feb	9.8	1-Mar	11	1-Apr	16	1-May	13.7	1-Jun	0
	2006	1-Jan	17.6	1-Feb	30.1	1-Mar	35.4	1-Apr	42.6	1-May	39.3	1-Jun	9.4
	2007	1-Jan	13	1-Feb	17.2	1-Mar	27.4	1-Apr	26.3	1-May	18.5	1-Jun	0
	2008	1-Jan	10.7	1-Feb	24.6	1-Mar	34.7	1-Apr	44.1	1-May	42.4	1-Jun	16.4
	2009	1-Jan	12.2	1-Feb	16	1-Feb	21.6	1-Apr	32.4	1-May	25.7	1-Jun	0
Average SWE on first of month for years 1981-2009:													
		1-Jan	13	1-Feb	21	1-Feb	27	1-Apr	30	1-May	23	1-Jun	4

http://www.wcc.nrcs.usda.gov/ftpref/data/snow/snow_course/table/history/oregon/22g33s.txt