

Analysis of effects on SWP (DRAFT 10/10/2017; for MVP)

Project Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vehicle Operation and Foot Traffic	physical impacts to individuals, habitat degradation	crushing, competition, collection, chemical contaminants	introduction of invasive species, poaching, exposure to chemicals from surface water runoff	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush and kill SWP plants in the construction ROW. For SWP plants downslope of the construction ROW, AMMs (e.g., Upland Erosion Control, Revegetation, and Maintenance Plan, Exotic and Invasive Species Control Plan, Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff and competition from invasive plants in the construction ROW. Cleared ROW may increase chances of poaching and attract ORV traffic due to increased ease of public access, potentially causing collection, crushing, and death. AMM of installing barriers such as signs, fences, gates, vegetation, or boulders along the construction ROW to discourage use of ORVs on ROW to avoid illegal access will minimize ORV effects.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	physical impacts to individuals, habitat degradation	soil compaction, altered hydrology, changes to evapotranspiration rates and soil moisture, downslope erosion, sedimentation, burial, competition	removal of vegetation, erosion, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush, remove, and kill SWP plants in the construction ROW. For SWP plants downslope of the construction ROW, this subactivity will also affect the SWP colony's upslope drainage area. AMMs (e.g., Upland Erosion Control, Revegetation, and Maintenance Plan, Exotic and Invasive Species Control Plan, Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff and competition from invasive plants in the construction ROW. Soil compaction and clearing of vegetation in the upslope drainage area and diversion of surface water flow away from the SWP colony due to temporary slope breakers and sediment barriers will alter the surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture of the SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants.
New Disturbance - Construction	Clearing - trees and shrubs	physical impacts to individuals, habitat degradation	changes to sunlight regime, soil compaction, altered hydrology, increased soil temperature, changes to evapotranspiration rates and soil moisture, downslope erosion, sedimentation, burial, competition	removal of over- and mid-story vegetation, erosion, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush and kill SWP plants. We do not anticipate SWP re-establishing and growing in the construction ROW post-construction due to removal of both trees and mycorrhizal fungi that require host trees (e.g., oaks [Quercus spp.], hickories [Carya spp.] and beech [Fagus grandifolia]) (McCormick et al. 2015). SWP depend on mycorrhizal fungi for nutrition, growth, and survival. For SWP plants downslope of the construction ROW, this subactivity will also affect the SWP colony's upslope drainage area. AMMs (e.g., Upland Erosion Control, Restoration and Rehabilitation Plan, Exotic and Invasive Species Control Plan [EISCP], Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff and competition from invasive plants in the construction ROW. Soil compaction and clearing of vegetation in the upslope drainage area and diversion of surface water flow away from the SWP colony due to temporary slope breakers and sediment barriers will alter the surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture of the SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. Removal of mid- and over-story trees will also increase direct and ambient light in the construction ROW and areas adjacent to it, which may increase SWP flowering and population size, but beyond an unknown threshold, is anticipated to degrade the SWP habitat by increasing soil temperature, drying soils, and changing evapotranspiration rates, thereby affecting SWP as described above. The EISCP will not address herbaceous and invasive vegetation growing outside of the construction ROW and near SWP colony due to the increased light. Invasive species could compete with SWP for light, space, and nutrients, causing decreased fitness and reproductive success. <i>Approximately 20-30??years after applying woody seed mixes to the temporary construction ROW, canopy trees (e.g., white oak) are expected to provide some mid-story shade (Burns et al. 1990), which would contribute to partially restoring the SWP habitat.</i>
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals, habitat degradation	competition, crushing	spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush and kill SWP plants in the construction ROW. Chipped brush will not be blown off of the construction ROW into environmentally sensitive areas. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species in the construction ROW.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	physical impacts to individuals, habitat degradation	burning	NA	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will kill SWP plants and seeds in the construction ROW.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	physical impacts to individuals, habitat degradation	changes to sunlight regime, increased soil temperature, changes to evapotranspiration rates and soil moisture, competition	trimming of over- and mid-story vegetation, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	Trimming of mid- and over-story trees will increase direct and ambient light in the construction ROW and areas adjacent to it, which may increase SWP flowering and population size. Beyond an unknown threshold, an increase in direct and ambient light is anticipated to degrade SWP habitat by increasing soil temperature, drying soils, and changing evapotranspiration rates, causing decreased fitness and reproductive success and possibly death of individual SWP. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species in the construction ROW, but not address herbaceous and invasive vegetation growing outside of construction ROW and near SWP colony due to increased light. Invasive species could compete with SWP for light, space, and nutrients, causing decreased fitness and reproductive success and possibly death of individual SWP.
New Disturbance - Construction	Grading, erosion control devices	physical impacts to individuals, habitat degradation	soil compaction, altered hydrology, changes to soil moisture, downslope erosion, sedimentation, burial	erosion	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush, remove, and kill SWP plants in the construction ROW. For SWP plants downslope of the construction ROW, this subactivity will also affect the SWP colony's upslope drainage area. AMMs (e.g., Upland Erosion Control, Revegetation, and Maintenance Plan, Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff. Soil compaction and ground disturbance in the upslope drainage area and diversion of surface water flow away from the SWP colony due to temporary slope breakers and sediment barriers will alter the surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture of the SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	physical impacts to individuals, habitat degradation	crushing, altered hydrology, changes to soil moisture, downslope erosion, sedimentation, burial	erosion, movement of soil and larger material (e.g. boulders) when blasting	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush, dig up, and kill SWP plants. For SWP plants downslope of the construction ROW, this subactivity will also affect the SWP colony's upslope drainage area. AMMs (e.g., Upland Erosion Control, Revegetation, and Maintenance Plan, Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff. Ground disturbance in the upslope drainage area and diversion of surface water flow away from the SWP colony due to temporary slope breakers and sediment barriers will alter the surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture of the SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. Blasting may also loosen large rocks, which could fall and crush SWP.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	neutral	none	NA	NA	NA	NA	NA	NE	This subactivity will occur in areas that have already been disturbed and will not affect SWP.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	physical impacts to individuals, habitat degradation	soil compaction, altered hydrology, changes to soil moisture, downslope erosion, sedimentation, burial, competition, increased nutrients, chemical contaminants	reggrading in upslope drainage area, erosion, spread of herbaceous and invasive plant species, exposure to nutrients from storm water runoff (fertilizers, decomposed vegetation), exposure to chemicals from surface water runoff and wind	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	This subactivity will crush, dig up, and kill SWP plants in the construction ROW. For SWP plants downslope of the construction ROW, this subactivity will also affect the SWP colony's upslope drainage area. AMMs (e.g., Upland Erosion Control, Revegetation, and Maintenance Plan, Exotic and Invasive Species Control Plan, Restoration and Rehabilitation Plan) will minimize potential effects from surface water runoff, soil compaction, and competition from invasive plants in ROW. Ground disturbance in the upslope drainage area and diversion of surface water flow away from the SWP colony due to temporary slope breakers and sediment barriers will alter the surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture of the SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. For controlling invasive plants, hand application methods will be used along the construction ROW and no herbicides will be applied within 25 ft of federally listed plant species unless approved by the Service or USFS. In addition, SWP are located at least 70 ft from the construction ROW and therefore are not likely to be exposed to herbicides.
New Disturbance - Construction	Facilities - noise, lights	neutral	none	NA	NA	NA	NA	NA	NE	Facilities not proposed near the SWP colony.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	neutral	none	NA	NA	NA	NA	NA	NE	No temporary or permanent access roads proposed near SWP colony.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	neutral	none	NA	NA	NA	NA	NA	NE	No temporary or permanent access roads proposed near SWP colony.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent- tree trimming and tree removal	neutral	none	NA	NA	NA	NA	NA	NE	No temporary or permanent access roads proposed near SWP colony.
New Disturbance - Construction	Stream Crossings, flume	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
New Disturbance - Construction	Stream Crossings, dam & pump	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
New Disturbance - Construction	Stream Crossings, cofferdam	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
New Disturbance - Construction	Stream Equipment Crossing Structures	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non- riparian) - clearing	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non- riparian) - tree side trimming	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non- riparian) - grading, trenching, regrading	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non- riparian) - pipe stringing	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
Operation & Maintenance	Facilities - vehicles, foot traffic, noise	neutral	none	NA	NA	NA	NA	NA	NE	Facilities not proposed near the SWP colony.

Operation & Maintenance	Vegetation Management - mowing	physical impacts to individuals, habitat degradation	soil compaction, altered hydrology, changes to evapotranspiration rates and soil moisture, downslope erosion, burial, competition	removal of vegetation, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	The permanent ROW is not anticipated to be suitable habitat for SWP. For SWP plants downslope of the permanent ROW, this subactivity will affect the SWP colony's upslope drainage area. Soil compaction and removal of vegetation in the upslope drainage area will increase surface water flow and downslope erosion rates and alter surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture in SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	physical impacts to individuals, habitat degradation	changes to sunlight regime, soil compaction, altered hydrology, increased soil temperature, changes to evapotranspiration rates and soil moisture, downslope erosion, burial, competition	removal of over- and mid-story vegetation, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	The permanent ROW is not anticipated to be suitable habitat for SWP. For SWP plants downslope of the permanent ROW, this subactivity will affect the SWP colony's upslope drainage area. Soil compaction and removal of vegetation in the upslope drainage area will increase surface water flow and downslope erosion rates and alter surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture in SWP habitat downslope of the permanent ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. This subactivity will also redistribute and loosen soils, which will cause sedimentation downslope towards the colony. Depending on the degree of surface water runoff and sedimentation, SWP habitat may be degraded and individual stems may be buried. Removal of mid- and over-story trees will also increase direct and ambient light, which may increase SWP flowering and population size, but beyond an unknown threshold, is anticipated to degrade the SWP habitat by increasing soil temperature, drying soils, and changing evapotranspiration rates, causing decreased fitness and reproductive success and possibly death of individual SWP. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species in the permanent ROW, but not address herbaceous and invasive vegetation growing outside of the permanent ROW and near the SWP colony due to the increased light. Invasive species could compete with SWP for light, space, and nutrients, causing decreased fitness and reproductive success and possibly death of individual SWP.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	physical impacts to individuals, habitat alteration	chemical contaminants	exposure to chemicals from surface water runoff and wind	NA	NA	NA	NA	NLAA	The permanent ROW is not anticipated to be suitable habitat for SWP. <i>depends on conservation measures</i>
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	habitat degradation	competition	spread of herbaceous and invasive plant species	NA	NA	NA	NA	NLAA	The permanent ROW is not anticipated to be suitable habitat for SWP. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species. <i>depends on conservation measures</i>
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	neutral	none	NA	NA	NA	NA	NA	NE	The permanent ROW is not anticipated to be suitable habitat for SWP.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	habitat degradation	changes to sunlight regime, increased soil temperature, changes to evapotranspiration rates and soil moisture, competition	trimming of over- and mid-story vegetation, spread of herbaceous and invasive plant species	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	Trimming of mid- and over-story trees will increase direct and ambient light in the SWP colony adjacent to the permanent ROW, which may increase SWP flowering and population size. Beyond an unknown threshold, an increase in direct and ambient light is anticipated to degrade SWP habitat by increasing soil temperature, drying soils, and changing evapotranspiration rates, causing decreased fitness and reproductive success and possibly death of individuals. Methods described in the Exotic and Invasive Species Control Plan will minimize impacts due to invasive species in the permanent ROW, but not address herbaceous and invasive vegetation growing outside of permanent ROW and near SWP colony due to increased light. Invasive species could compete with SWP for light, space, and nutrients, causing decreased fitness and reproductive success and possibly death of individual SWP.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	physical impacts to individuals, habitat degradation	soil compaction, altered hydrology, changes to soil moisture, downslope erosion, burial, sedimentation	regrading, erosion	habitat, population, individuals	injury, death	reproduction, nutrition, habitat	numbers, reproduction	LAA	The permanent ROW is not anticipated to be suitable habitat for SWP. For SWP plants downslope of the permanent ROW, this subactivity will affect the SWP colony's upslope drainage area. Soil compaction and ground disturbance will increase surface water flow and downslope erosion rates and alter surface and subsurface hydrology in the watershed of the colony, causing changes in evapotranspiration rates and soil moisture in SWP habitat downslope of the construction ROW. These stressors are likely to affect both the mycorrhizal fungi relied on by SWP and individual SWP, decreasing fitness and reproductive success and possibly killing individual plants. This subactivity will also redistribute and loosen soils, which will cause sedimentation downslope towards the colony. Depending on the degree of surface water runoff and sedimentation, SWP habitat may be degraded and individual stems may be buried.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	neutral	none	NA	NA	NA	NA	NA	NE	SWP is not an aquatic species and not found in streams and wetland areas.
Operation & Maintenance	Access Road Maintenance - grading, graveling	neutral	none	NA	NA	NA	NA	NA	NE	No temporary or permanent access roads proposed near SWP colony.
Operation & Maintenance	Access Road Maintenance - culvert replacement	neutral	none	NA	NA	NA	NA	NA	NE	No temporary or permanent access roads proposed near SWP colony.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	neutral	none	NA	NA	NA	NA	NA	NE	Subactivity not proposed near the SWP colony.
Operation & Maintenance	Inspection Activities - ground and aerial	neutral	none	NA	NA	NA	NA	NA	NE	The permanent ROW is not anticipated to be suitable habitat for SWP.