Negative Impacts

Perhaps the most grievous impact of the removal of trees within the pond walls would be the loss of the unique and ethereal character created by the protruding and leaning trees. This would be both a loss of aesthetic and historic value. The replacement with poplars outside the pond walls would require the construction of an external irrigation ditch or pressurized irrigation system and as mentioned by PISP staff, the potential disruption of archaeological resources. Root systems and suckering growth from new plants may re-invade the pond walls. In addition to the cost of an additional irrigation system, its construction and the removal/replacement of trees would create a disturbance of the soil surface, noise and dust. Construction activities and their results would also affect PISP visitors, for which this area is a major attraction. Assuming the necessary comprehensive removal of the existing trees in conjunction with pond repair activities, there would be a considerable loss of vegetation stratification and shaded microclimates until the replacement trees were well established. This would affect migrating and nesting bird species, water temperatures, and macro-invertebrate populations within the ponds. Establishing a engineered drip irrigation system will use some amount of additional water system water, however, it will be countered by spring water presumably saved as a result of trees not consuming or transpiring spring water from the ponds. Replacement with Lombardy poplars would have an impact as different than current tree types.

**1B Option: Removal of trees within the east, south and west pond walls at the time of reconstruction/rehabilitation of ponds. Establish new trees within the east, south, and west walls. Selective replacement of existing trees outside of all walls, including north wall. An irrigation system will be necessary.**

Positive Impacts

The removal of trees around the ponds at the time of the reconstruction/ rehabilitation of the ponds would complement reconstruction/rehabilitation activities. The replacement of the trees in the reconstructed walls would reestablish the unique character and historic integrity of the pond area and its long term existing trees. Park staff note that the north walls do not seem to be

significant sites of pond leakage, whereas the walls down-slope are contributors to the problem. Retaining the trees in the north wall would preserve some representative qualities of the historic and cultural landscape and will retain the habitat values of the woodland adjacent to the ponds. Pond reconstruction with a pond liner and establishing an engineered drip irrigation system to these trees should deter root growth into the ponds and possibly more efficiently provide water to the trees only in the quantities necessary for their survival, therefore, overall conserving water more efficiently.

Negative Impacts

Negative Impacts are similar to those associated with the removal of trees as mentioned in the above optional actions. Retention of existing trees outside pond walls will require some degree of maintenance activity and irrigation efforts. Establishing a engineered drip irrigation system will use some amount of additional water system water, however, it will be countered by spring water presumably saved as a result of trees not consuming or transpiring spring water from the ponds.

**2 Action: Rehabilitation of elms west of fort, following one of two options**

Note: complete removal without replacement is not an option. The elms are contributing features that must be represented. Under Section 106 complete removal would be an Unmitigated Adverse Effect.

**2A Option: Preservation of elms west of the fort with gradual replacement by undergrowth offspring . In this option the elms will be managed in a state of decay for as long as possible.**

Positive Impacts

Preserving the elms until seedlings/saplings have established preserves the historic landscape and enhances the authenticity of the visitor experience. It provides a protective microclimate for the growing seedlings/saplings while also minimizing the impact of the loss on bird species and enhancing the habitat quality for species dependant on dead wood and snags. This action is most likely to be successful. Under Section 106, 2A would likely be No Adverse Effect.

Negative Impacts

The preservation of the elms may require considerable man-power related to the removal of dangerous limbs, the treatment of conditions contributing to their decline (disease, drought etc.), and the promotion of replacement seedlings. If the dying elms are retained until the seedlings/saplings have become established, the risk of damage to the fort by falling limbs is increased. The controlled removal of dead trees is difficult and unpredictable, also increasing the risk of damage to the fort and surrounding trees. Noise and dust associated with the periodic maintenance and ultimate removal of the dead elms would disrupt the visitor experience.

**2B Option: Removal of elms west of the fort once they have reached a critical state of decay and replacement by undergrowth offspring. In this option, the elms will be completely removed once they begin to seriously decline.**

Positive Impacts

Completely removing the elms once they reach a critical point of decay would prevent possible damage to the fort and surrounding trees due to limb loss and/or collapse. It would also require less maintenance and a single disturbance event, reducing the impact of noise and dust on the visitor experience.

Negative Impacts

The complete removal of the elms (once they have reached a critical state of decay) would negatively affect some bird species. The removal could also threaten the successful establishment of replacement elms by eliminating a microhabitat important to young trees. This may require more maintenance to prevent failure. The fort could be damaged during the removal of the stumps if roots are well established beneath the structure. Shredding the stumps into mulch may significantly reduce this risk. Noise and dust associated with removal would disrupt visitor experiences for a short time. The historic landscape would also be seriously degraded by the loss of the mature elms until the replacement elms reached similar heights. Under Section 106, 2B would likely be a Mitigated Adverse Effect.

**3 Action: Preservation of historic wagon road trace, maintaining West cabin spring outflow with selective removal of vegetation. Any or all of the following actions could be pursued.**

**3A Action: Clear invasive natural and exotic vegetation from historic road trace.**

Positive Impacts

The historic road trace will appear as it presumably would have looked at the time of its continuous historic use, thus enhancing the historic district and the cultural landscape.

Negative Impacts

Some soil disturbance in the road trace itself will occur and possibly encourage the promotion of exotic vegetation.

**3B Action: Clear exotic vegetation from West Cabin spring outflow.**

Positive Impacts

The maintenance of the West cabin spring outflow will preserve the historic integrity of the spring's flow pattern. It will promote the flow of spring water over a greater distance and the utilization of that spring water by increased amounts of native plants and possibly native wildlife.

Negative Impacts

Removal of exotic vegetation from the West cabin spring outflow will cause some soil disturbance and may cause some disturbance of invertebrates.

**4 Action: Replacement of trees north of the chicken house.** According to the PISP CLI prepared in 2006, the few silver-leaf cottonwoods clustered to the west of the chicken house could be offspring of historic plantings, however as no historical evidence has been located to document their origin, they are noted by the report as being of undetermined significance. It is proposed that a couple of clumps of Populus alba (silver-leaf cottonwood) be planted in the area, and existing weakened trees be removed over time as new plantings mature.

Positive Impacts

The trees adjacent to the chicken house provide bird habitat and soil stabilization along the hillside. The trees also possibly represent the movement of groundwater within PISP. The preservation of the existing clustering pattern has interpretive qualities

Negative Impacts

The replacement of the dead trees with young trees would require maintenance until the replacement trees become self sustaining.

**5 Action: Selective thinning of shrubs**

Positive Impacts

The selective removal of shrubs would prevent encroachment into areas used for circulation or historic interpretation.

Negative Impacts

The selective thinning of shrubs would create localized soil disturbances associated with removal of shrubs. The thinning of shrubs may also interfere with natural successional processes and expose surfaces to invasion by exotic grasses.