Table 1. Estimated Annual Instantaneous Peak Flood Discharges for Colony Creek.

Percent Annual Chance Flood	Return Period	Colony Creek at Colony Mt Drive (cfs)	West Branch Colony Creek near Lower Beaver Dam (cfs)
50%	2-year	95	30
10%	10-year	215	70
4%	25-year	290	100
2%	50-year	355	125
1%	100-year	420	145
0.2%	500-year	490	175

Table 2: Summary and Screening of Alternatives for Flood and Sediment Management for Colony Creek

Description of Alternatives				Assessment of Alternatives											
Alternative Number	Colony Creek Crossing	Stream Channel Modifications	Other Features	Flood Event that can be Passed Immediately after Construction (recurrance Interval, years)*	Number of Years Until 10-year Flood Begins to Overtop Colony Road (years)**	Volume of Sediment that can Deposit before Channel Capacity is Limited to the 10-year Flood (cubic yards)	Long Term Channel Adjustments	Flood Management Success for Colony Road	Flood Management Success for Properties North of the Stream Downstream of Crossing	Sediment Maintenance Requirements	Construction Impact to Existing Stream	Environmental/Agency and Tribe Objections	General Comments	Relative Capital Cost	Overall Ranking
Do Nothing															
1	Existing Twin 7-ft Diameter CMPs	Annual maintenance (remove up to 50 cu yds/year)		<2-year	0	0	Channel upstream from culverts will continue to fill with sediment.	No -- Conditions will worsen just upstream from the culverts. Most of the water will overtop Colony Road upstream from the culverts and enter the blueberry field. There will be a reduction in flooding along Colony Road downstream from the culverts because the channel will carry less water.	Yes -- Most water will overtop Colony Road upstream from the crossing and flow through the blueberry field. Flooding north of the stream will be reduced because the channel will carry less water.	Annual maintenance (remove up to 50 cu yds/year)	Annual excavation immediately upstream and downstream from the crossing	Dislike annual sediment removals. Want long term solution.	Expect more frequent road closures due to water overtopping Colony Road upstream from crossing. Owner of blueberry field will not be pleased.	Very Low -- County maintenance crew would perform work	Unacceptable -- Alternative does nothing to address the problem
Leave Existing Culverts															
2A	Existing Twin 7-ft Diameter CMPs	Excavate and restore existing channel 500-ft downstream. Also remove some sediment within the first 100 feet upstream to taper to meet existing channel bed.	1. Fill low spots along road d/s. 2. Low berm along road u/s.	25-year	1 to 2 years	400	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding upstream and in the first 500-ft downstream from crossing. Will not improve conditions 2500 ft downstream near the driveway bridges	Will reduce flooding along excavated reach, but will not improve condtions further downstream.	Re-excavate and reconstruct 500-ft section of channel every 1 to 2 years?	Disturbance of 500 feet of channel downstream and 100 feet upstream	Dislike -- Channel will have to be restored frequently	Not worthwhile since major channel restoration will be required frequently.	Low -- Less than $20,000.	Very Low
2B	Existing Twin 7-ft Diameter CMPs	Excavate and restore existing channel 500-ft downstream. Also remove some sediment within the first 100 feet upstream to taper to meet existing channel bed.	1. Fill low spots along road d/s. 2. Low berm along road u/s. 3. Remove earthen spoil berm and farm access road from north side of channel	25-year	2 years	500	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding upstream and in the first 500-ft downstream from crossing. Will not improve conditions 2500 ft downstream near the driveway bridges	Will reduce flooding along excavated reach, but will not improve condtions further downstream.	Re-excavate and reconstruct 500-ft section of channel every 2 years?	Disturbance of 500 feet of channel downstream and 100 feet upstream	Dislike -- Channel will have to be restored frequently	Not worthwhile since major channel restoration will be required frequently.	Low -- Less than $20,000.	Very Low
2C	Existing Twin 7-Diameter CMPs	Excavate and restore existing channel 3000-ft downstream	1. Fill low spots along road d/s. 2. Low berm along road u/s. 3. Remove earthen spoil berm and farm access road from north side of channel	100-year	10 to 12 years	1500 to 2000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding in the vicinity of the intersection and downstream; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the downstream reach.	Flooding will be reduced along most of the reach; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the downstream reach.	Re-excavate and reconstruct 3000-ft section of channel every 10 to 12 years?	Disturbance of approximately 3000 feet of channel. Also some trees along north side of channel will be removed	Dislike -- Significant disturbance to existing stream bed and channel, but this option does limit the frequency of disturbance	Worth discussing? -- Pros: many years between maintenace dredging cycles and low cost, Cons -- WDFW, tribe, etc. will not like disturbance of existing channel.	Low -- Less than $60,000.	Low to High Low -- agencies will probably not allow, High -- low cost and provides significant flood relief
Replace Existing Culverts with New Culvert in Same Location															
3A	Install 8-ft High by 20 ft Wide Concrete Box Culvert	None	1. Fill low spots along road d/s. 2. Low berm along road u/s	2-year	0	0	Channel will continue to fill with sediment and bed will rise	Reduced frequency of flooding upstream from crossing, but conditions will worsen downstream as channel continues to fill with sediment.	Frequency and severity of flooding will increase as channel fills with sediment	Annual maintenance (remove up to 50 cu yds/year)	Annual excavation immediately upstream and downstream from the crossing	Dislike annual sediment removals. Want long term solution.	Not worthwhile	Moderate -- Less than $250,000	Very Low -- Alternative does not reduce flooding downstream
3B	Install 14-ft High by 20-ft Wide Concrete Box Culvert	Excavate and restore existing channel 500-ft downstream	1. Fill low spots along road d/s. 2. Low berm along road u/s 3. Remove earthen spoil berm and farm access road from north side of channel	25-year	5 to 7 years	1000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding upstream and in the first 500-ft downstream from crossing. Will not improve conditions 2500 ft downstream near the driveway bridges.	Will reduce flooding frequency along excavated reach for a limited time, but as the channel fills the pasture will flood more frequently because the berm will be gone. Will not improve condtions further downstream.	Re-excavate and reconstruct 500-ft section of channel every 5 to 7 years?	Disturbance of 500 feet of channel downstream and 100 upstream. Also some trees along north side of channel will be removed	Dislike -- Channel will have to be restored frequently	Not worthwhile since major channel restoration will be required frequently.	Moderate -- Less then $300,000	Low
3C	Install 14-ft High by 20-ft Wide Concrete Box Culvert	Excavate and restore existing channel 3000-ft downstream	1. Fill low spots along road d/s. 2. Low berm along road u/s 3. Remove earthen spoil berm and farm access road from north side of channel	100-year	20 to 25 years	2500 to 3000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding in the vicinity of the intersection and downstream; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Flooding will be reduced along most of the reach; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Re-excavate and reconstruct 3000-ft section of channel every 20 to 25 years?	Disturbance of approximately 3000 feet of channel. Also some trees along north side of channel will be removed	Dislike -- Significant disturbance to existing stream bed and channel, but this option does limit the frequency of disturbance	Worth discussing? -- Pros: new culvert, many years between maintenace dredging cycles, and low cost, Cons -- WDFW, tribe, etc. will not like disturbance of existing channel.	Moderate -- Less than $350,000	Low to Medium Low -- agencies will prefer over 2C, Medium -- Moderate cost, provides significant flood relief
Replace Existing Culverts with New Culvert and Move Crossing North															
4A	Install 8-ft High by 20 ft Wide Concrete Box Culvert just North of existing Culverts	Dig new channel which ties into existing channel 650-ft downstream	1. Fill low spots along road d/s. 2. Low berm along road u/s	25-year	15 to 20 years	2000 to 2500	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding in the vicinity of the intersection and downstream; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Acquired property will flood frequently, further downstream no significant change from today's condition.	Re-excavate and reconstruct downstream floodplain and channel of channel every 15 to 20 years?	Disturbance extending 100 feet upstream from culvert. Disturbance downstream mainly confined to field not existing stream	Favorable	Promising	Moderate -- Less than $500,000	Medium (Would receive "High" except cost is relatively high)
4B	Install 8-ft High by 20 ft Wide Concrete Box Culvert just North of existing Culverts	Dig new channel which ties into existing channel 650-ft downstream	1. Fill low spots along road d/s. 2. Low berm along road u/s 3. Excavate floodplain to allow alluvial fan to develop downstream from culvert	25-year	30 to 45 years	4000 to 6000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding in the vicinity of the intersection and downstream; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Acquired property will flood frequently, further downstream no significant change from today's condition.	Re-excavate channel and alluvial fan area in 30 to 45 years	Disturbance extending 100 feet upstream from culvert. Disturbance downstream mainly confined to field not existing stream	Favorable	Promising	Moderate -- Less than $550,000	Medium (would receive "High" except cost is relatively high)
4C	Install 8-ft High by 20 ft Wide Concrete Box Culvert just North of existing Culverts	Dig new channel which ties into existing channel 650-ft downstream. Excavate and restore existing channel downstream to end of reach	1. Fill low spots along road d/s. 2. Low berm along road u/s 3. Excavate floodplain to allow alluvial fan to develop downstream from culvert	100-year	30 to 50 years	4000 to 7000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Will reduce frequency of flooding in the vicinity of the intersection and downstream; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Flooding will be reduced along most of the reach; however, it will not reduce flooding signficantly near the driveway bridges. Flood levels in this area are controlled by backwater from the newly restored reach.	Re-excavate channel and alluvial fan area in 30 to 50 years	Disturbance extending 100 feet upstream from culvert. Disturbance of approximately 2500 feet of the existing channel.	Favorable -- Except for removal of sediment from existing downstream channel	Promising	Moderate -- Less than $600,000	Medium (would receive "High" except cost is relatively high)
Redirect Colony Creek Under Colony Road															
5	Install 8-ft High by 20 ft Wide Concrete Box Culvert under Colony Road	Dig new channel downstream	1. Low berm along road u/s. 2. Excavate floodplain d/s to allow alluvial fan to develop. 3. Install second culvert d/s.	100-year	30 to 50 years	4000 to 7000	Immediately following excavation, upstream channel will degrade. This sediment will partially fill the newly excavated channel and culverts	Good	Good	Re-excavate channel and alluvial fan area in 30 to 50 years	Disturbance extending 100 feet upstream from culvert. Downstream disturbance mainly confined to field not existing stream	Favorable	Expensive - Two culverts required plus land aqusition. Channel may eventually migrate into the bluebarry field.	High (1,000,000 to $1,500,000) consider partnering with non-profit to design and construct new channel through blueberry field	Low -- very expensive

*We simulated the 2-, 10-, 25-, 50-, and 100-year floods. The event reported in this column corresponds to one of these events. We did not try to refine the recurrance interval.

**Sediment would be allowed to accumulate downstream until the culvert could just pass the 10-year flood. This assumes NO beaver dam outburst flood occurs during period.

Table 2 (Continued): Summary and Screening of Alternatives for Flood and Sediment Management for Colony Creek

Description of Alternatives				Assessment of Alternatives											
Alternative Number	**Colony Creek Crossing**	**Stream Channel Modifications**	**Other Features**	**Flood Event that can be Passed Immediately after Construction (recurrance Interval, years)***	**Number of Years Until 10-year Flood Begins to Overtop Colony Road (years)****	**Volume of Sediment that can Deposit before Channel Capacity is Limited to the 10-year Flood (cubic yards)**	**Long Term Channel Adjustments**	**Flood Management Success for Colony Road**	**Flood Management Success for Properties North of the Stream Downstream of Crossing**	**Sediment Maintenance Requirements**	**Construction Impact to Existing Stream**	**Environmental/Agency and Tribe Objections**	**General Comments**	**Relative Capital Cost**	**Overall Ranking**
Description of Alternatives															
6A	Existing Twin 7-ft Diameter CMPs	Alternative 2B plus Upstream Sediment Basin	Same as Alternative 2B	25-year	N/A. If upstream sediment basin is maintained, culverts at Colony Mountain Drive should remain free of sediment.	N/A. If upstream sediment basin is maintained, sediment should not fill downstream channel	Downstream channel may degrade slightly due to reduced sediment transport and deposition.	Will reduce frequency of flooding upstream and in the first 500-ft downstream from crossing. Will not improve conditions 2500 ft downstream near the driveway bridges	Will reduce flooding along excavated reach, but will not improve condtions further downstream.	Clean Sediment Basin once every ten years or more frequently depending upon size and frequency of floods. Frequency could be increased if smaller basin is desired.	Disturbance of 500 feet of channel downstream and upstream to and through the Sediment Basin	Dislike -- Sediment Basin will have to be cleaned periodically	From County perspective this would be an attractive alternative	Low -- Less than $150,000 (mainly depends upon cost of land)	Low to High Low -- agencies may not allow, High -- reasonable cost and provides longterm flood relief
6B	Existing Twin 7-ft Diameter CMPs	Alternative 2B plus Upstream Sediment Collection Area	Same as Alternative 2B	25-year	N/A. If upstream sediment collection area is maintained, culverts at Colony Mountain Drive should remain free of sediment.	N/A. If upstream sediment basin is maintained, sediment should not fill downstream channel	Downstream channel may degrade slightly due to reduced sediment transport and deposition.	Will reduce frequency of flooding upstream and in the first 500-ft downstream from crossing. Will not improve conditions 2500 ft downstream near the driveway bridges	Will reduce flooding along excavated reach, but will not improve condtions further downstream.	Clean Sediment Collection Area once every two to three years or more frequently depending upon size and frequency of floods	Disturbance of 500 feet of channel downstream and upstream to and through the Sediment Collection Area	Dislike -- Sediment Collection area will have to be cleaned periodically	From County perspective this would be an attractive alternative	Low -- Less than $150,000 (mainly depends upon cost of land)	Low to High Low -- agencies may not allow, High -- reasonable cost and provides longterm flood relief

*We simulated the 2-, 10-, 25-, 50-, and 100-year floods. The event reported in this column corresponds to one of these events. We did not try to refine the recurrance interval.

**Sediment would be allowed to accumulate downstream until the culvert could just pass the 10-year flood. This assumes NO beaver dam outburst flood occurs during period.

Special Note: Alternatives 6A and 6B combine upstream sediment managemnet strategies with Alternative 2B. They could just as well be combined with any of the alternatives presented on the preceeding page.