Appendix H
Coverage Information

Methodology for Estimating Land Coverage and the Effects of Policy Changes Related to Coverage Transfer Areas in the Draft Regional Plan Update EIS and Draft Regional Transportation Plan EIR/EIS

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Overview

This memorandum describes the methodology developed by the Tahoe Regional Planning Agency (TRPA) for calculating changes in land coverage that could result from the new allocations authorized under the Regional Plan Update alternatives. This memorandum also describes the approach for evaluating potential changes in the distribution of coverage resulting from some of the proposed changes to coverage transfer areas in Regional Plan Update alternatives.

Under each Regional Plan Update alternative, the amount of new coverage would depend on the design and location of individual projects, which would be subject to existing and proposed regulations that ensure the maximum allowable coverage is not exceeded at the project scale. Each alternative would also include the removal of existing coverage as a result of the continuation or modification of certain programs and provisions, such as coverage transfer requirements, the excess coverage mitigation program, and the Environmental Improvement Program. A good-faith effort was made to disclose the potential amount and distribution of coverage that could result from new development, changes to coverage transfer ratios, and the maximum allowable coverage in community centers in each alternative.

The location and extent of existing coverage was based on impervious surfaces derived from aerial LIDAR data and multi-spectral satellite images collected in August 2010. The amount of new coverage associated with each unit of development—tourist accommodation unit (TAU), commercial floor area (CFA), Residential Allocation, and Residential Bonus Unit—was based on an average coverage per unit derived from a sample of existing developed units (described below). New coverage scenarios were applied to both the Bailey Land Capability map and the 2007 Natural Resources Conservation Service (NRCS) soil survey. Coverage scenarios were estimated separately based on each map, displaying a range that would address some of the variability that could result from future site-specific land capability verifications at individual project sites. The methodology utilizes five separate components: (1) estimate coverage resulting from each type of authorized allocation; (2) estimate the total amount of coverage within and outside community centers; (3) distribute new coverage to individual land capability districts (LCDs); (4) estimate the coverage transfer requirement; and (5) distribute the coverage reductions to individual LCDs.

Under Alternatives 1, 2, and 5, coverage transfers are allowed only within the same Hydrologically Related Area (HRA). Under Alternative 3, coverage transfers could occur throughout the Region. Under Alternative 4, coverage could be transferred within HRAs or from an HRA that is over-covered in aggregate to one that is not over-covered. To assist in evaluating potential changes in the distribution of coverage resulting from the proposed changes to transfer provisions, TRPA evaluated data on factors that can provide an indication of the degree to which HRAs would send or receive greater amounts of coverage Region-wide: (1) land values, (2) existing market price of coverage, and (3) inventory of coverage available for sale in each HRA. These factors were considered in aggregate to estimate the likelihood that each HRA would be a net sender or receiver of coverage transfers without HRA transfer restrictions.

Background

Coverage is defined by TRPA (Code Chapter 90) as a human-built structure or other impervious surface that prevents normal precipitation from directly reaching the surface of the land underlying the structure, therefore precluding or slowing the natural infiltration of water into the soil. TRPA further defines coverage as impervious

surface (hard coverage) or compacted soil (soft coverage). Research has established the connection between impervious and compacted surfaces and water quality (Schueler 1994). Specifically, coverage may affect water quality because it reduces the amount of soil available to filter water, which can cause increased flows of stormwater runoff, stream channel erosion, and delivery of pollutants to receiving waters.

Since the late 1970s, TRPA has used the land capability classification system known as the Bailey system (Land-Capability Classification of the Lake Tahoe Basin, California-Nevada: A Guide to Planning [Bailey 1974]) to guide land use planning, policy formulation related to the impacts of development on soil erosion, and permitting of development (Code Chapter 30). The Bailey system was developed as a threat assessment and planning tool to identify and mitigate adverse impacts to water quality and stream systems, based primarily on LCDs that reflect soil characteristics and slope. The LCDs range from 1 to 7, with 1 being the most environmentally sensitive and 7 being most suitable for supporting development without causing substantial soil or water quality degradation.

Under this system, TRPA allows landowners to cover 1, 5, 20, 25, or 30 percent of their parcel with impervious surfaces depending on its environmental sensitivity as defined by the Bailey system. New development is allowed in LCDs 4–7 and is significantly limited in LCDs 1–3, particularly in LCD 1b (Stream Environment Zone [SEZ]). Exceptions for development in LCDs 1–3 include development related to public outdoor recreation facilities and water quality control facilities. Exceptions are also identified for single-family development under the Individual Parcel Evaluation System (IPES) and Tyrolian Village in LCDs 1a, 1c, 2, and 3. Stream crossings to access an otherwise-buildable IPES parcel may also be allowed. In most instances, new coverage in LCDs 1–3 must be mitigated at a ratio of 1.5:1 (mitigation to impact). IPES applies to all new single-family residences built from 1987 onward. IPES is based on the Bailey system and, although it may result in different allowable coverage at the individual parcel level, it is intended to reflect Bailey system development standards when reviewed in aggregate.

Coverage from Development Authorized Under Each Alternative

Overview

Coverage estimates under each alternative were developed based on the assumption that all authorized development would be constructed. The distribution of new development within and outside community centers reflects the distribution assumptions used in the TRPA transportation demand model (see Appendix E). Coverage reductions from transfers reflect the transfer ratios proposed in each alternative and the amount of coverage that would need to be transferred to allow the full amount of development to occur in community centers under each alternative. Estimates of new coverage were assigned to individual LCDs based on the proportion of each district in the areas where the development could occur. Coverage reductions from transfers were assumed to come from individual LCDs based on the proportion of existing coverage within each district.

The coverage resulting from development authorized under each alternative was estimated using the following steps: (1) estimate coverage resulting from each type of authorized allocation, (2) estimate the total amount of coverage within and outside community centers, (3) distribute new coverage to individual LCDs, (4) estimate the coverage transfer required, and (5) distribute the coverage reductions to individual LCDs. Each analytical step is described in more detail below.

Step 1. Estimate Coverage Resulting from Each Type of Authorized Allocation

Coverage associated with each residential allocation, residential bonus unit, TAU, and square foot of CFA was estimated from the actual coverage associated with a sample of existing development (Table 1). Existing coverage was estimated from an impervious surface layer created from aerial LIDAR data and satellite imagery collected in August 2010. For example, to estimate the amount of coverage associated with each new single-family residential unit, all single-family residences, existing as of 2010 were identified from the TRPA parcel GIS database (36,178 units). The total coverage on all parcels with a single-family residence was calculated from the impervious surface data (1,885.38 acres or 82,127,230 square feet). The total coverage was divided by the

number of single-family residences to obtain an average coverage of 0.052114004 acre or 2,270 square feet of coverage per single-family residence.

Table 1: Estimated Coverage Resulting from Each Type of Development

Type of development	Unit	Existing units	Total coverage (sq. ft.)	Average coverage per unit (sq. ft.)
Single-family residential	residence	36,178	82,127,230	2,270
Multi-family residential	residence	4,011	2,630,037	655.7
Tourist accommodation	TAU	9,200	4,789,020	520.5
Commercial	Square foot of CFA	–[1]	–[1]	1.25

[1] Data on the amount of CFA per existing development were not available. Because all Regional Plan Update alternatives include incentives to concentrate commercial development in community centers and incentives to limit coverage, it is expected that a portion of new CFA would be in developments with multiple stories, which would reduce the coverage associated with each square foot of CFA. However, each square foot of CFA would require parking and other accessory impervious surfaces. To reflect the coverage resulting from the CFA as well as accessory surfaces, it was assumed that each square foot of CFA would result in 1.25 square feet of coverage.

Step 2. Estimate the Total Amount of Coverage Within and Outside Community Centers

Coverage within Community Centers: To ensure that the coverage analysis considered the maximum coverage likely to occur under each alternative, it was assumed that all development allocations authorized under each alternative would be constructed. The number of residential units within and outside community centers reflects each alternative's proposed incentives to concentrate development in community centers, based on the assumptions used in the transportation model (Appendix E). All new commercial and tourist accommodation development is assumed to occur within community centers. For Alternatives 1, 2, 4, and 5, residential bonus units and approximately 10% of new residential allocations are assumed to result in multi-family developments within community centers. For Alternative 3, a higher proportion of residential development is expected to occur within community centers as a result of new residential transfer incentives (for more details, see Appendix E). For all alternatives, residential development in community centers was assumed to be limited to multi-family developments. Table 2 shows the number of new units and corresponding area of coverage expected to occur within community centers under each alternative.

Table 2: New Units and Coverage within Community Centers for Each Alternative

Development Type	Coverage per Unit (sq. ft.)	Alternative 1 Units	Alternative 1 Coverage (sq. ft.)	Alternative 2 Units	Alternative 2 Coverage (sq. ft.)	Alternative 3 Units	Alternative 3 Coverage (sq. ft.)	Alternative 4 Units	Alternative 4 Coverage (sq. ft.)	Alternative 5 Units	Alternative 5 Coverage (sq. ft.)
Multi-Family Residential	655.7	874	573,082	1,134	743,564	2,594	1,700,886	1,274	835,362	1,274	835,362
TAUs	520.5	342	178,011	342	178,011	342	178,011	542	282,111	742	386,211
CFA	1.25	383,600	479,500	583,600	729,500	583,600	729,500	783,600	979,500	983,600	1,229,500
Total Coverage (sq. ft.)			1,230,593		1,651,075		2,608,397		2,096,973		2,451,073
Total Coverage (ac res)			28.2506		37.9035		59.88056		48.1399		56.2689

Coverage Outside Community Centers: The remaining residential allocations authorized under each alternative were assumed to follow the existing pattern of development outside community centers and result in single-family residences dispersed throughout residential areas. No new commercial, tourist accommodation, or multi-family residential units were assumed to be constructed outside community centers. Table 3 shows the number of single-family residences and resulting coverage outside community centers for each alternative.

Table 3: New Single-Family Residences and Coverage Outside Community Centers for Each Alternative

Development Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Single family residential units	86	2,426	1,566	3,686	3,767
Coverage per unit (sq. ft.)	2,270	2,270	2,270	2,270	2,270
Total Coverage (sq. ft.)	195,220	5,507,020	3,554,820	8,367,220	8,551,090
Total Coverage (acres)	4.48164	126.4238	81.6074	192.0849	196.3060

Step 3. Distribute New Coverage to Individual LCDs

New coverage within community centers and from single-family residences outside community centers was assigned to individual LCDs based on the proportion of land where development could occur within each LCD. (Note: The IPES system specifically allows for new single-family residential development on land that would be equivalent to Bailey LCDs 1–3. Development on these sensitive lands is offset by other planning regulations and/or mitigation measures.)

Coverage within Community Centers: For each alternative, the total coverage within community centers (from Table 2) was distributed based on the proportion of developable land within community centers that is within each LCD. For each alternative, the boundaries of the proposed community centers (which differ slightly among alternatives) were used to estimate the proportion of developable land within each LCD. In community centers, new development and transfers of coverage are generally restricted to high-capability land (LCDs 4–7), classified here using both the Bailey land capability map and the NRCS 2007 soil survey. For each LCD, the area and percent of total developable (i.e., high-capability and not already covered) land within community centers was identified (Table 4).

For each alternative, the total new coverage within community centers (from Table 2) was distributed proportionately to each LCD based on the percent of developable land within each LCD (from Table 4). New coverage within community centers was distributed to LCDs separately based on proportions from the Bailey land capability map and the NRCS 2007 soil survey (Table 5).

Table 4: Existing High-Capability Lands within Community Centers Without Coverage.

	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Bailey Land Capability Map										
LCD 4	39.7	5.7	39.7	5.7	39.8	5.2	31.6	4.4	39.7	5.7
LCD 5	182.7	26.4	182.7	26.4	185.6	24.0	139.9	19.6	182.7	26.4
LCD 6	197.1	28.5	197.1	28.5	197.2	25.5	177.1	24.8	197.1	28.5
LCD 7	272.0	39.3	272.0	39.3	349.3	45.2	365.3	51.2	272.0	39.3

NRCS 2007 Soil Survey

	Alt 1		Alt 2		Alt 3		Alt 4		Alt 5	
LCD 4	48.2	5.6	48.2	5.6	48.5	5.0	15.0	1.8	48.2	5.6
LCD 5	162.3	18.8	162.3	18.8	186.0	19.1	141.7	16.6	162.3	18.8
LCD 6	310.9	36.1	310.9	36.1	314.3	32.3	297.4	34.9	310.9	36.1
LCD 7	340.1	39.5	340.1	39.5	424.8	43.6	399.0	46.8	340.1	39.5

Note: High-capability lands within community centers are assumed to be those lands eligible for development.

Table 5. New Coverage on High-Capability Lands within Community Centers

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Bailey Land Capability Map					
LCD 4	1.62	2.17	3.28	2.13	3.22
LCD 5	7.45	10.00	15.28	9.41	14.84
LCD 6	8.04	10.78	16.23	11.92	16.01
LCD 7	11.09	14.88	28.74	24.58	22.09
Total [1]	**28.2**	**37.83**	**63.53**	**48.04**	**56.16**
NRCS 2007 Soil Survey					
LCD 4	1.58	2.12	3.16	0.84	3.14
LCD 5	5.31	7.13	12.14	7.98	10.58
LCD 6	10.18	13.65	20.51	16.75	20.27
LCD 7	11.13	14.93	27.71	22.47	22.17
Total [1]	28.2	37.83	63.52	48.04	56.16

NOTE: New coverage in Alternative 3 includes coverage from new development authorized as well as coverage from 250 existing residential units assumed to transfer into community centers as a result of residential transfer incentives (see Appendix E for more details).
[1] Total acreages for each alternative may not match totals in Table 2 due to rounding.

Coverage Outside Community Centers: For each alternative, the total coverage outside community centers (from Table 3) was distributed to individual LCDs based on the respective proportion of land with potential for new residential development. Under the IPES system, new single-family residential development can occur in all LCDs except 1b (SEZ). To identify the areas eligible to receive new coverage outside community centers, all vacant private land in residential Plan Area Statements was identified. For each LCD except 1b (SEZ), the area and percent of total vacant private land with residential development potential was identified using both the Bailey land capability map and the NRCS 2007 soil survey (Table 6).

Table 6: Total Vacant Private Land Available for Coverage from New Single-Family Residential Development by LCD

Land Capability District	Bailey Land Capability Map		NRCS 2007 Soil Survey	
	Acres	Percent	Acres	Percent
1a	228.73	18.14	47.41	3.40
1c	25.94	2.06	13.47	0.97
2	63.30	5.02	79.23	5.68
3	108.24	8.58	58.44	4.19
4	148.88	11.81	325.52	23.33
5	368.17	29.19	239.76	17.18
6	204.29	16.20	430.58	30.86
7	113.59	9.01	201.10	14.41

For each alternative, the total new coverage outside community centers (from Table 3) was distributed proportionately to each LCD based on the respective proportion of land with the potential for new development (Table 6). New coverage outside community centers was distributed to LCDs separately based on proportions from the Bailey land capability map, and the NRCS 2007 soil survey (Table 7).

Table 7: New Coverage Outside Community Centers Assigned to Each LCD

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Bailey Land Capability					
LCD 1a	0.81	22.93	14.80	34.84	35.60
LCD 1c	0.09	2.60	1.68	3.95	4.04
LCD 2	0.22	6.35	4.10	9.64	9.85
LCD 3	0.38	10.85	7.00	16.49	16.85
LCD 4	0.53	14.92	9.63	22.68	23.17
LCD 5	1.31	36.91	23.82	56.08	57.31
LCD 6	0.73	20.48	13.22	31.12	31.80
LCD 7	0.40	11.39	7.35	17.30	17.68
Total [1]	**4.47**	**126.43**	**81.6**	**192.1**	**196.3**
NRCS 2007 Soils Survey					
LCD 1a	0.15	4.29	2.77	6.53	6.67
LCD 1c	0.04	1.22	0.79	1.85	1.89
LCD 2	0.25	7.18	4.63	10.91	11.15
LCD 3	0.19	5.29	3.42	8.04	8.22
LCD 4	1.05	29.49	19.04	44.81	45.79
LCD 5	0.77	21.72	14.02	33.00	33.73
LCD 6	1.38	39.01	25.18	59.27	60.57
LCD 7	0.65	18.22	11.76	27.68	28.29
Total [1]	**4.48**	**126.42**	**81.61**	**192.09**	**196.31**

[1] Total acreages for each alternative may not match totals in Table 3 due to rounding.

Step 4. Estimate the Coverage Transfers Required

Maximum allowable coverage on a parcel (50 or 70 percent of high capability lands in community centers under the Regional Plan Update Alternatives) is the sum of the base allowable coverage and the transferred coverage. As such, all new coverage in community centers in excess of base allowable coverage would need to be transferred from other parcels. Thus, this step considers base allowable coverage and the amount of coverage that would be transferred from another parcel to meet the maximum allowable coverage.

Since virtually all developed parcels in community centers have already used all available base allowable coverage on the parcel, remaining base allowable coverage is associated with vacant parcels. The total area of all vacant developable parcels was identified within the community centers proposed under each alternative. To determine the amount of base allowable coverage, the total area of LCDs 4–7 was calculated according to the Bailey Land Capability Map and NRCS 2007 Soil Survey. Because base allowable coverage varies between 20 percent and 30 percent on developable lands (i.e., LCDs 4–7) in community centers, this analysis assumes 30 percent coverage. This represents a conservative estimate because it assumes less coverage would need to be transferred into the community centers to meet the maximum allowable coverage on a parcel. The difference between the base allowable coverage and the maximum allowable coverage is the maximum amount that could be transferred into the community centers.

The percentage of all new coverage that would result from transfers was multiplied by the area of new coverage associated with each alternative (see Table 2) to determine the amount of anticipated coverage transfers. Table 8 shows the estimates of total and base allowable coverage and coverage transfers for each alternative based on the Bailey land capability map. Table 9 shows the same estimates based on the NRCS 2007 soil survey.

Table 8. Total, Base, and Transferred Coverage under Each Alternative (Bailey Land Capability Map)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Acres of allowable new coverage in community centers[1]	150.53	149.85	310.25	301.98	150.53
Acres of LCDs 4–7 in vacant parcels in community centers	95.15	95.15	107.75	90.70	95.15
Estimated base allowable coverage (acres)[2]	28.54	28.54	32.32	27.21	28.54
Acres of allowable new coverage requiring transfers[3]	121.99	121.31	277.93	274.77	121.99
Percent of total coverage requiring transfers[4]	81.04%	80.95%	89.58%	90.99%	81.04%
Acres of new coverage resulting from authorized development[5]	28.19	37.83	63.52	48.04	56.15
Acres of coverage transfers required[6]	22.84	30.62	56.90	43.71	45.51

[1] Total increase in coverage to achieve maximum allowable coverage within all community centers.
[2] Estimated base allowable coverage = (30 percent) x (LCDs 4-7 in vacant parcels).
[3] Acres of allowable new coverage requiring transfers = (total increase in coverage to achieve maximum allowable coverage) – (base allowable coverage within community centers).
[4] Percent of total coverage requiring transfer = (area of allowable new coverage requiring transfer) / (area of new coverage allowable in community centers).
[5] See Step 2.
[6] Transfer acreage required under each alternative = (acreage from new allocations) x (percent of new coverage requiring transfers).

Table 9. Total, Base, and Transferred Coverage under Each Alternative (NRCS 2007 Soil Survey)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Acres of allowable new coverage in community centers[1]	*220.62*	*201.72*	*405.97*	*380.49*	*220.62*
Acres of LCD 4-7 in vacant parcels in community centers	*108.62*	*108.62*	*122.84*	*95.66*	*108.62*
Estimated base allowable coverage (acres)[2]	*32.58*	*32.58*	*36.86*	*28.70*	*32.58*
Acres of allowable new coverage requiring transfers[3]	*188.04*	*169.14*	*369.11*	*351.79*	*188.04*
Percent of new coverage requiring transfers[4]	*85.23%*	*83.85%*	*90.92%*	*92.46%*	*85.23%*
Acres of new coverage resulting from authorized development[5]	*28.19*	*37.83*	*63.52*	*48.04*	*56.15*
Acres of coverage transfers required[6]	*24.02*	*31.72*	*57.75*	*44.42*	*47.86*

[1] Total increase in coverage to achieve maximum allowable coverage within all community centers.

[2] Estimated base allowable coverage = (30 percent) x (LCDs 4-7 in vacant parcels).

[3] Acres of allowable new coverage requiring transfers = (total increase in coverage to achieve maximum allowable coverage) – (base allowable coverage within community centers).

[4] Percent of total coverage requiring transfer = (area of allowable new coverage requiring transfer) / (area of new coverage allowable in community centers).

[5] See Step 2.

[6] Transfer acreage required under each alternative = (acreage from new allocations) x (percent of new coverage requiring transfers).

Step 5. Distribute the Coverage Reductions from Transfers to Individual LCDs

The impervious surface GIS layer derived from 2010 aerial LIDAR data and multi-spectral satellite imagery was used to estimate total existing coverage. Total existing coverage was overlaid onto LCDs to determine the percentage of total existing coverage within each LCD. The percentage of existing coverage within each LCD was estimated separately based on the Bailey land capability map and the NRCS 2007 soil survey. Once the percentage of existing coverage per LCD was determined, the total amount of coverage transfers for each alternative (Tables 8 and 9) was distributed to each LCD so that after the transfer ratios were applied, the proportion of coverage removed reflected the proportion of existing coverage within each LCD. Due to rounding, the total resulting amount of transferred coverage differed slightly from the total amounts shown in Tables 8 and 9 for some alternatives, but this variation totaled less than 0.25 acre for each alternatives.

In Alternatives 2–4, coverage transfer ratios are based on the LCD of the sending site. However, transfer ratios in Alternatives 1 and 5 vary from 1:1 to 2:1 (sending: receiving), based on the total resulting coverage at the receiving site. In Alternatives 1 and 5, vacant parcels can achieve a maximum allowable coverage of 70% percent of LCDs 4-7, at a transfer ratio of 2:1. Already developed parcels are limited to 50% coverage of LCDs 4-7, at a transfer ratio of 1:1. Assuming each parcel transferring in coverage would achieve the parcel's maximum allowable coverage, transfers to developed parcels would be at a 1:1 ratio and transfers to undeveloped parcels would be at a 2:1 ratio. To develop an average transfer ratio for Alternatives 1 and 5, the percentage of developed and undeveloped parcels in Community Plan Areas was identified. Approximately 90% of these parcels are already developed, with approximately 10% being undeveloped, which would result in an average transfer ratio of 1.1:1.

Tables 10 through 14 show the percentage of existing coverage within each LCD, the acres of coverage transferred from each LCD, and the acres of coverage removed from each LCD for each alternative. Separate estimates are provided based on the Bailey land capability map and the NRCS 2007 soil survey.

Table 10: Alternative 1 Coverage Reductions in Each LCD from Transfers to Community Centers.

	Bailey Land Capability Map				NRCS 2007 Soil Survey			
	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed
1a	11%	2.60	1.1	2.86	2%	0.39	1.1	0.43
1b	19%	4.41	1.1	4.85	11%	2.55	1.1	2.80
1c	4%	0.90	1.1	0.99	6%	1.44	1.1	1.58
2	4%	0.82	1.1	0.90	3%	0.70	1.1	0.77
3	7%	1.56	1.1	1.71	4%	0.85	1.1	0.93
4	9%	2.01	1.1	2.21	15%	3.63	1.1	3.99
5	20%	4.56	1.1	5.01	14%	3.42	1.1	3.77
6	13%	3.06	1.1	3.37	28%	6.82	1.1	7.50
7	13%	2.92	1.1	3.21	18%	4.21	1.1	4.63
Total	100%	22.84		25.12	100%	24.02		26.42

Table 11: Alternative 2 Coverage Reductions in Each LCD from Transfers to Community Centers.

	Bailey Land Capability Map				NRCS 2007 Soils Survey			
	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed
1a	11%	4.25	1.25	5.31	2%	0.75	1.25	0.94
1b	19%	9.25	1	9.25	11%	6.75	1	6.75
1c	4%	1.50	1.25	1.88	6%	3.00	1.25	3.75
2	4%	1.50	1.25	1.88	3%	1.50	1.25	1.88
3	7%	2.75	1.25	3.44	4%	2.00	1.25	2.50
4	9%	2.25	2	4.50	15%	4.50	2	9.00
5	20%	4.75	2	9.50	14%	4.25	2	8.50
6	13%	2.15	3	6.45	28%	5.60	3	16.80
7	13%	2.15	3	6.45	18%	3.60	3	10.80
Total	100%	30.55		48.65	100%	31.95		60.91

Table 12: Alternative 3 Coverage Reductions in Each LCD from Transfers to Community Centers.

	Bailey Land Capability Map				NRCS 2007 Soils Survey			
	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed
1a	11%	8.50	1	8.50	2%	2.00	1	2.00
1b	19%	15.00	1	15.00	11%	10.00	1	10.00
1c	4%	3.00	1	3.00	6%	5.25	1	5.25
2	4%	3.00	1	3.00	3%	2.75	1	2.75
3	7%	5.25	1	5.25	4%	3.40	1	3.40
4	9%	3.75	2	7.50	15%	6.75	2	13.50
5	20%	7.75	2	15.50	14%	6.25	2	12.50
6	13%	5.25	2	10.50	28%	13.00	2	26.00
7	13%	5.25	2	10.50	18%	8.25	2	16.50
Total	100%	56.75		78.75	100%	57.7		91.90

Table 13: Alternative 4 Coverage Reductions in Each LCD from Transfers to Community Centers.

	Bailey Land Capability Map				NRCS 2007 Soils Survey			
	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed	Percent of impervious area w/in LCD	transfers	transfer ratio	coverage removed
1a	11%	6.50	1	6.50	2%	1.25	1	1.25
1b	19%	11.50	1	11.50	11%	7.75	1	7.75
1c	4%	2.50	1	2.50	6%	4.25	1	4.25
2	4%	2.50	1	2.50	3%	2.00	1	2.00
3	7%	4.00	1	4.00	4%	3.00	1	3.00
4	9%	2.75	2	5.50	15%	5.25	2	10.50
5	20%	6.00	2	12.00	14%	5.00	2	10.00
6	13%	4.00	2	8.00	28%	9.75	2	19.50
7	13%	4.00	2	8.00	18%	6.25	2	12.50
Total	100%	43.75		60.50	100%	44.50		70.75

Table 14: Alternative 5 Coverage Reductions in Each LCD from Transfers to Community Centers.

	Bailey Land Capability Map				NRCS 2007 Soils Survey			
	Percent of impervious area w/in LCD	*transfers*	*transfer ratio*	*coverage removed*	*Percent of impervious area w/in LCD*	*transfers*	*transfer ratio*	*coverage removed*
1a	*11%*	*5.19*	*1.1*	*5.71*	*2%*	*0.78*	*1.1*	*0.86*
1b	*19%*	*8.78*	*1.1*	*9.66*	*11%*	*5.07*	*1.1*	*5.58*
1c	*4%*	*1.79*	*1.1*	*1.97*	*6%*	*2.87*	*1.1*	*3.15*
2	*4%*	*1.64*	*1.1*	*1.80*	*3%*	*1.40*	*1.1*	*1.54*
3	*7%*	*3.11*	*1.1*	*3.42*	*4%*	*1.69*	*1.1*	*1.86*
4	*9%*	*4.01*	*1.1*	*4.41*	*15%*	*7.23*	*1.1*	*7.95*
5	*20%*	*9.08*	*1.1*	*9.98*	*14%*	*6.83*	*1.1*	*7.51*
6	*13%*	*6.10*	*1.1*	*6.71*	*28%*	*13.59*	*1.1*	*14.95*
7	*13%*	*5.82*	*1.1*	*6.40*	*18%*	*8.40*	*1.1*	*9.23*
Total	*100%*	*45.51*		*50.06*	*100%*	*47.86*		*52.65*

Effects of Policy Changes Related to Coverage Transfer Areas

Under Alternatives 1, 2, and 5, coverage transfers are allowed only within the same Hydrologically Related Area (HRA). Under Alternative 3, coverage transfers could occur throughout the Region. Under Alternative 4, coverage could be transferred within HRAs or from an HRA that is over-covered in aggregate to one that is not over-covered. To assist in evaluating potential changes in the distribution of coverage resulting from the proposed changes to transfer provisions, TRPA evaluated data on factors that can provide an indication of the degree to which HRAs would send or receive greater amounts of coverage Region-wide: (1) land values, (2) existing market price of coverage, and (3) inventory of coverage available for transfer in each HRA. These factors were considered in aggregate to estimate the likelihood that each HRA would be a net sender or receiver of coverage transfers without HRA transfer restrictions.

Land Values: HRAs with higher land values would be more likely to receive coverage from HRAs with lower land values because coverage is a commodity associated with individual parcels of land. It would be more economically feasible to purchase land and transfer its coverage where land values are lower. The values for land value were derived from US Census data and current MLS real estate listings. Land value rankings for each HRA were created by obtaining the average and median values, determining the deviation between the average and median, and then setting an interval around the median equal to that deviation. Anything higher than the established interval was ranked "High," anything within the interval was ranked "Average," and anything below the interval was ranked "Low."

Existing Market Price of Coverage: The existing market price of coverage in each HRA is affected by the demand for coverage in the HRA and the supply of coverage in that HRA available for transfer. A high market price for coverage would indicate that the HRA has a high demand for transferred coverage and/or a limited supply of coverage available for transfer, which would make that HRA more likely to receive coverage transferred from other HRAs. The existing market price of coverage was based on a recent regional appraisal of coverage costs (Barnett 2010). Market price rankings were created by obtaining the average and median values, determining the deviation between the average and median, and then setting an interval around the median equal to that deviation. Market prices higher than the established interval were ranked "High," prices within the interval were ranked "Average," and prices below the interval were ranked "Low." Table 15 summarizes the market price of coverage for each HRA.

Table 15: Market Price and Acquisition and Restoration Costs in Each HRA.

HRA	Market Price Potential High Capability[1]	Market Price Potential Low Capability[1]	Market Price Existing[2]	Cost to Acquire Potential[2]	Cost to Acquire and Restore Existing[2]
Incline, NV	$22.00	$33.50	$22.00	$40.00	$40.00
Marlette, NV	$12.00	$12.00	-	-	-
Cave Rock, NV	$25.00	$25.00	$30.00	$45.00	-
South Stateline, NV	$15.00	$15.00	$15.00	$35.00	$55.00
South Stateline, CA	$5.00	$25.00	$6.50	$17.50	$35.00
Upper Truckee River, CA	$6.50	$25.00	$8.50	$20.00	$20.00
Emerald Bay, CA	$8.00	$30.00	$8.00	$50.00	-
McKinney Bay, CA	$7.25	$20.00	$7.50	$50.00	-
Tahoe City, CA	$10.00	$10.00	$10.00	$35.00	$45.00
Agate bay, CA	$10.00	$10.00	$30.00	$30.00	$20.00
Agate bay, NV	$18.00	$18.00	$25.50	$85.00	-

[1] Where the same market price is shown for high and low capability lands, insufficient data was available to distinguish price variations based on land capability.
[2] Limited data was available and it showed high variance. The appraisal incorporated previous analysis and market knowledge including comparison to land bank asking price and related sales activity.

Inventory of Available Coverage: A large inventory of coverage for sale indicates that the supply of coverage available for transfer is greater than the demand for coverage in the HRA, in which case the HRA would likely transfer more coverage to other HRAs than it would receive. Conversely, a low inventory of available coverage indicates that demand for coverage has kept up with the supply of available coverage and transfers of coverage into that HRA would be more likely. The estimate of coverage inventory was based on land bank inventories of coverage from 2011 (Table 16). Coverage inventory rankings were created by obtaining the average and median values, determining the deviation between the average and median, and then setting an interval around the median equal to that deviation. HRAs with inventories higher than the established interval were ranked "High," inventories within the interval were ranked "Average," and inventories below the interval were ranked "Low."

Table 16: Land Bank Inventory in 2011.

	Potential	Hard Coverage	Soft Coverage
South Stateline			
NV	0	311	15,548
CA	23,112	3,952	1,168
Upper Truckee	664,233	47,422	42,732
Emerald Bay	1,252	0	0
McKinney Bay	41,408	0	0
Tahoe City	48,314	0	0
Agate Bay			
CA	28,198	0	0
NV	0	3,500	0
Cave Rock	0	0	0
Incline	205,955	0	37,430
Marlette	0	0	0

Likelihood of Net Sending or Receiving: The likelihood that each HRA would be a net sender or receiver of transferred coverage was estimated by assigning numerical values to each ranking of land values, market price, and inventory. Values of 1 were assigned to rankings that indicate the HRA would not be a net receiving area (i.e., low real estate values or market price, or high inventory). Values of 2 were assigned to all "Average" rankings. Values of 3 were assigned to rankings that indicate an HRA would be more likely to be a net receiving area (i.e., high land values or market price, or low inventory). Two HRAs had no inventory of coverage available for transfer. Since this is a strong indicator that those HRAs would not be net sending areas, they were assigned a value of 4 for the inventory of coverage. For each HRA, the values were averaged for real estate values, market price, and inventory to determine the likelihood that an HRA would be a net receiving area. HRAs with an average score of 1–2 were considered to have a low likelihood of being a net receiving area. Average scores of 2–2.5 indicated that the HRA had an average likelihood of being a net receiving area and an equal likelihood of being a net sending area. HRAs with an average score of 2.5 or greater were considered to have a high likelihood of being a net receiving area. Table 17 shows the rankings for land values, market price, and inventory for each HRA, as well as the aggregate likelihood that each HRA would be a net coverage receiving area without existing transfer restrictions.

While the market forces summarized in Table 17 provide an indication of the potential distribution of coverage transfers, many other factors would affect the actual distribution of coverage transfers. Variations within each HRA with respect to land value could influence transfers. Coverage transfers are allowed only under specific circumstances, and the amount of land within each HRA where transfers would be allowed was not addressed here. As such, this estimate provides a reasonable indication of transfer patterns, but does not predict the exact future distribution of coverage.

Table 17: Relative Likelihood of Transfer within Each HRA.

HRA	Land Values	Market Price	Inventory	Receiving Likelihood
Incline, NV	High	High	High	Average
Marlette, NV	High	Average	None	High
Cave Rock, NV	High	High	None	High
South Stateline, NV	Low	Average	Average	Low
South Stateline, CA	Low	Low	Average	Low
Upper Truckee River, CA	Low	Average	Average	Low
Emerald Bay, CA	Average	Average	Low	Average
McKinney Bay, CA	Average	Low	Average	Low
Tahoe City, CA	High	Low	Low	Average
Agate Bay, CA	Average	Low	Average	Low
Agate Bay, NV	Average	High	Low	High

References

Bailey, Robert G. 1974. Land-Capability Classification of the Lake Tahoe Basin, California-Nevada: A Guide to Planning. South Lake Tahoe, California.

Barnett, L. C. 2010. A Summary Appraisal Addressing the Market Value of Land Coverage and the Cost to Acquire and Restore Land Coverage Located in the Lake Tahoe Basin. Prepared for TRPA for the Purpose of Estimating Market Value as of December 31, 2009.

Natural Resources Conservation Service. 2007. Soil survey of the Tahoe Basin Area, California and Nevada. Available: <http://soils.usda.gov/survey/printed_surveys/>. Accessed December 29, 2011.

Schueler, T. 1994. The Importance of Imperviousness. Watershed Protection Techniques 1(3): 100-111.