MITIGATION RATIOS and ASSESSMENTS
EXAMPLES AND ALTERNATIVES

Mitigation ratios can be used to standardize the amount of mitigation needed to compensate for the impacts of individual projects. Use of mitigation ratios requires an explanation of what both sides of the ratio mean.

Guidance on Mitigation from HCP Handbook

- Mitigation programs should be based on sound biological rationale; they should also be practicable and commensurate with the impacts they address. (pg. 3-19, 3rd paragraph)
- Issuance of a Section 10 permit must not "appreciably reduce" the likelihood of the survival and recovery of the species in the wild. Note that this does not explicitly require an HCP to recover listed species, or contribute to their recovery objectives outlined in a recovery plan. This reflects the fact that HCPs were designed by Congress to authorize incidental take, not to be mandatory recovery tools (pg 3-20, 2nd paragraph). However, recovery is nevertheless an important consideration in any HCP effort… Thus, contribution to recovery is often an integral product of an HCP, but it is not an explicit statutory requirement (pg. 3-20, 3rd paragraph). [*original emphasis*]
- The type of mitigation habitat and its proximity to the area of impact will need to be considered. Generally the location of replacement habitats should be as close as possible to the area of impact, it must also include similar habitat types and support the same species affected by the HCP. However, there may be good reason to accept mitigation lands that are distant from the impact area -- e.g., if a large habitat block as opposed to fragmented blocks can be protected or if the mitigation lands are obtained through a mitigation fund. (pg 3-21, paragraph 4)
- When habitat losses permitted under an HCP are permanent, protection of mitigation lands normally should also be permanent. (pg. 3-22, 4th paragraph)

Examples from Other HCPs and Consultations

Camp Bullis Programmatic Biological Opinion (Sept 22, 2009)

Impacts to GCW habitat on the Installation may be mitigated with habitat protected and managed, in perpetuity, either on or off the Installation (but within the limits of the proposed GCW Recovery Unit 5).

BO establishes a variable mitigation ratio based on the suitability and occupancy status of the impacted habitat as follows:

Habitat Type	Mitigation Ratio (acres of off-site mitigation : acres of impact)
Non-habitat Buffers Around Occupied Habitat (within 300 ft of occupied suitable habitat)	0.5 : 1
Unoccupied Suitable Habitat	1.0 : 1
Unoccupied Buffer Habitat (unoccupied suitable habitat within 300 ft of occupied suitable habitat)	2.0 : 1
Occupied Suitable Habitat (demonstrated occupancy within at least one of the prior 3	3.0 : 1

** all mitigation ratios are expressed as mitigation : impact*

years)

Suitable habitat is defined as woodlands with at least 30% canopy cover, at least 5% deciduous canopy composition, and the presence of juniper trees with stripping bark.

Acceptable mitigation lands may be either "suitable habitat" or "non-habitat buffers" of suitable habitat, and demonstration of habitat occupancy is preferred but not required. Each acre of suitable habitat is equivalent to one acre of mitigation. Each acre of non-habitat buffer is equivalent to 0.5 acre of mitigation.

For on-site mitigation, the effective mitigation ratios are reduced for the protection of large patches (at least 500 contiguous acres) of occupied suitable habitat within the Installation. Each acre of on-site mitigation of this type is equivalent to 3 acres of off-site mitigation (i.e., the effective mitigation rate is reduced to a maximum of 1.0 : 1).

Individual 10(a) Permits in Bexar County

La Cantera EA/HCP (2001) – Impacts to 3 caves occupied by *Cicurina madla* and/or *Rhadine exilis* were mitigated by the establishment of 1-acre preserves around 2 of the impacted caves and the creation of 5 off-site karst preserves (including 4 to 75 acres around each protected cave). The total acreage protected and managed in karst preserves was 181 acres.

Cibolo Canyon Master Phase 2 EA/HCP (2006) – Impacts to 846 acres of GCW habitat (fully or partially supporting 8 GCW territories) were mitigated with the protection of 760 acres of on-site GCW habitat (fully or partially supporting 12 GCW territories). The mitigation tract is adjacent to other GCW conservation lands.

Balcones Canyonlands Conservation Plan (1996)

The BCCP uses a defined fee structure for assessing mitigation requirements.

Typically, mitigation is assessed by overlaying a pre-determined map of "habitat zones" for the GCW, BCV, and karst invertebrates on the boundary of a legal parcel seeking to be enrolled in the plan. Delineations of the habitat zones were based on the extent of known or potential habitat for the covered species at the time the plan was developed. An alternative process is available for using USFWS-approved site-specific habitat assessments, but the per acre mitigation fees are higher.

Mitigation fees are assessed for the area of each habitat zone that occurs within the legal parcel being enrolled in the plan, regardless of the type of activity or impact. Per acre fees are highest for zones representing known habitat and reduced for zones representing unconfirmed (or potential) habitat.

The current fee structure is as follows:

- GCWA (zone 1 – confirmed habitat) = $5,500 / acre
- GCWA (zone 2 – unconfirmed habitat) = $2,750 / acre
- BCVI zone = $5,500 / acre
- Karst zone = $1,000 / acre

The BCCP has a defined mitigation commitment that is not directly tied to the level of participation in the plan. The permit requires the permanent protection and management of 11,000 acres of GCW habitat.

Williamson County RHCP (2008)

GCW and BCV: Mitigation assessments are based on an on-site habitat assessment, a presence/absence survey for the species (if available), and the extent and type of impact (direct or indirect).

If a presence/absence survey has been performed (1 year of surveys is sufficient), mitigation is only required for impacts to occupied habitat. An observation of a GCW or BCV in a patch of habitat establishes the entire patch of contiguous habitat as occupied by that species.

If a survey is not available, all potentially suitable habitat is assumed to be occupied and mitigation requirements for project impacts are based on the extent and quality of the potential habitat.

The base mitigation ratio for impacts to occupied or potential habitat is 1 : 1.

An increase in the base mitigation ratio may be determined on a case-by-case basis by the RHCP administrator. For the GCW, increased mitigation may be assessed for exceptionally high quality habitat (i.e., habitat patches that are at least 200 acres, have a canopy height greater than 20 feet, and have at least 90% canopy closure) or unusually high density occupation by the species (i.e., <17 acres/pair). For the BCV, increased mitigation may also be assessed based on habitat values (no specific criteria are identified). Mitigation ratios for impacts to these important habitats may be increased to 2 : 1. The RHCP administrator reserves the right to deny an application for participation.

Direct impacts to occupied or potential habitat are assessed at 100% of the applicable mitigation ratio. Direct impacts permanently remove or significantly modify habitat. Indirect impacts are assessed at 50% of the applicable mitigation ratio. Indirect impacts affect occupied or potential habitat that is adjacent to and within 250 feet of directly impacted habitat.

Mitigation acres for the GCW are typically acquired through the purchase of GCW conservation credits from the Hickory Pass Ranch Conservation Bank in Burnet County. BCV mitigation fees are banked and used for the benefit of BCV habitat restoration and management, as determined in consultation with USFWS. The plan may also establish conservation banks within Williamson County, in accordance with USFWS guidelines, as mitigation.

Karst Invertebrates: Mitigation assessments are based on a two-part strategy of a per acre fee for general disturbance of karst habitat and additional fees for impacts to known caves occupied by the covered species.

A Geologic Assessment prepared to TCEQ standards is required for project areas. If the Geologic Assessment identifies caves with the potential to be occupied by the covered species, a karst faunal presence/absence survey (prepared to USFWS standards) is required. At least 3 surveys must be completed, at least one week apart. If the covered species are detected, then the cave footprint must be mapped.

Mitigation fees of $100/acre are assessed for each acre of karst habitat disturbed by a project and provide coverage for any impacts to the covered species that are not in the immediate vicinity of an identified species-occupied cave (such as for voids or mesocaverns not detected by the surface Geologic Assessment).

No additional mitigation is required for impacts to identified caves not shown to be occupied by the covered species. For identified species-occupied caves, mitigation fees are typically assessed for each acre of Impact Zone disturbed. Impact Zone A extends between 50 and 345 feet from the mapped cave footprint and the mitigation fee for disturbance within this zone is $10,000/acre. Impact Zone B extends between 0 and 50 feet from the mapped cave footprint and any disturbance within this zone is assumed to destroy the long-term viability of the cave. Any incursion within Impact Zone B requires a flat mitigation fee of $400,000 for the impacts to the cave (fees for Impact Zone A are waived).

Hays County RHCP (draft Sept 28, 2009)

Hays County RHCP uses a conservation banking model. Mitigation ratios determine the number of mitigation credits needed for a particular project to participate in the RHCP and are based on the type of impact and the relative quality/importance of the habitat impacted. The USFWS reserves the right to review and approve all mitigation assessments. Hays County would determine the specific amount of mitigation needed through an on-site habitat determination and project-specific impact assessment.

The base mitigation ratio for direct impacts is 1.0 : 1. The base mitigation ratio for indirect impacts is 0.5 : 1.

County may on a case-by-case basis lower the base mitigation ratios for currently degraded habitats or increase the mitigation ratios (up to 3 times the base ratio) for impacts to exceptionally high quality habitats (such as habitats with dense canopy cover, very large habitat patch size, demonstrated occupancy by relatively high densities of the covered species, or close proximity to other conservation areas).

Direct impacts include all areas of potential habitat where the vegetation will be physically affected or altered by clearing or land development activities, or where the proposed use of the area will significantly change from pre-project conditions. Indirect Impacts include all areas of potential habitat that are within 300 feet of the edge of an area with direct effects. Indirect impact areas may extend outside of a project area. Areas of indirect impact may also include small and isolated remnant fragments of potential habitat that would not be expected to be used by the species after completion of the proposed project.

Mitigation is provided by the creation of conservation banks in Hays County, in accordance with USFWS policy for conservation banks. Typically, each acre of potential habitat protected and managed for the covered species creates 1 mitigation credit. Variations to the typical ratio may be possible on a case-by-case basis, considering factors such as relative habitat quality, habitat patch size, proximity to other protected habitats or intensive land uses, and the presence of habitat buffers. The minimum preserve size is 500 acres, comprised of either a single parcel or multiple adjacent parcels.

Comal County RHCP (draft April 2010)

Mitigation assessments are based on an on-site habitat assessment, a presence/absence survey for the species (if available), and the extent and type of impact (direct or indirect).

If a presence/absence survey has been performed, mitigation is only required for impacts to occupied habitat. An observation of a GCW or BCV in a patch of habitat establishes the entire patch of contiguous habitat as occupied by that species.

If a survey is not available, mitigation requirements for project impacts are based the extent and quality of the potential habitat.

Base mitigation ratios for GCW and BCV are typically 1 :1. Higher mitigation ratios (up to 3 : 1 for GCW and 2 : 1 for BCV) may be assessed for high quality or high occupancy habitat.

For GCW impacts, criteria for higher impacts may include impacts to habitat patches of at least 250 acres, canopy height greater than 20 feet, canopy closure greater than 70%, and being within or adjacent to an existing preserve. For the BCV, increased mitigation may also be assessed based on habitat values (no specific criteria are identified). The RHCP administrator reserves the right to deny an application for participation.

Direct impacts to occupied or potential habitat are assessed at 100% of the applicable mitigation ratio. Direct impacts permanently remove or significantly modify habitat. Indirect impacts are assessed at 50% of the applicable mitigation ratio. Indirect impacts affect occupied or potential habitat that is adjacent to and within 300 feet of directly impacted habitat.

Mitigation is provided by either 1) the creation of conservation bank preserves in Comal County, in accordance with USFWS policy for conservation banks; or 2) the purchase of conservation credits from a third-party conservation bank with a service area that includes Comal County.

For conservation bank preserves created within Comal County, preserves will be a minimum of 500 acres (except as allowed by USFWS on a case-by-case basis) and composed of single tracts or multiple adjacent or proximate tracts.

SUGGESTED SEP-HCP MITIGATION RATIOS

General Approach and Assumptions

Applicable to GCW and/or BCVs. Karst conservation strategy will need to use a different approach.

Two-tiered approach to mitigation ratios, depending on the type of information available for the mitigation assessment. If available (or desired), participants can base the assessment on a habitat delineation and species survey. Otherwise, the assessment is based only on the habitat assessment and the assumption that all identified habitat is occupied.

Suitable habitat is delineated based on a site-specific habitat assessment prepared by a USFWS–permitted biologist, and consistent with USFWS and TPWD definitions (i.e., at least 35% canopy closure, between 10% and 90% Ashe juniper composition, presence of at least some mature juniper, and canopy height at least approximately 15 feet). This definition includes both high quality nesting habitat and more open habitats used for foraging and post-fledging dispersal.

Individually mapped patches of habitat are considered contiguous (i.e., effectively part of the same patch) if separated by less than 50 feet, unless the separation is due to a high-impact land use (such as a regularly travelled public road). Requires at least a rough delineation of suitable habitat on adjacent properties for patches that intersect the project site (can be accomplished by the use of aerial imagery).

Option 1: Species Survey Results

Inputs: 1) delineation of suitable habitat, and 2) results of a recent USFWS protocol P/A or territory-level survey (i.e., a spot-mapping survey)

Impacted Habitat	Mitigation Ratio
Suitable habitat in an unoccupied patch	0
Suitable habitat in an occupied patch (at least 1 GCW observation recorded from the patch)	1 : 1
Habitat is within 372 ft of a GCW observation (radius of a 10-acre circle around each point)	2 : 1
Habitat patch containing at least 250 ac has a GCW density of ≥ 5 territories/100 ac of suitable habitat	3 : 1

(continued on next page)

Option 2: Habitat Patch Size

To be used if a protocol survey is not available or submitted by participant.

Inputs: 1) delineation of suitable habitat; and 2) patch size analysis of habitat within and contiguous with the project area

Impacted Habitat	Mitigation Ratio
Suitable habitat in patches of less than 500 acres	1 : 1
Suitable habitat in patches of between 500 and 1,000 acres	2 : 1
Suitable habitat in patches of at least 1,000 acres	3 : 1

Notes: mitigation ratio strategy *attempts to relate take to site-specific data on impacts to individual birds; approach encourages the use of species surveys with liberal delineations of suitable habitat to support mitigation assessments; could reduce mitigation obligations for a participant if habitat is shown to not be occupied; base level patch-based occupancy standard reduces the possible within-year and between-year variation in habitat use by the species; generally consistent with other RHCPs in the area, but with added certainty as to the mitigation requirements under different circumstances*

Alternative Basis for Mitigation Ratios:

- Location of impact
- Habitat quality factors (canopy cover, etc…)
- Pre-determined, map-based habitat coverages -- such as using habitat occupancy potential (i.e., per Magness et al. 2006 approach)

(continued on next page)

Examples from Select Properties

Examples illustrate the GCW mitigation obligation for three real-world project examples, based on prior survey and habitat assessment work completed by Loomis. The examples assume that the entire property is assessed for direct on-site impacts.

Option 1: Species Survey Results

Impacted Habitat	Mitigation Ratio	Property 1 – exceptional GCW habitat		Property 2 – generally average GCW habitat		Property 3 – low to average GCW habitat	
		Acres	Required Mitigation (acres)	Acres	Required Mitigation (acres)	Acres	Required Mitigation (acres)
Suitable habitat in an unoccupied patch	0	0	0	20	0	0	0
Suitable habitat in an occupied patch (at least 1 GCW observation recorded from the patch)	1 : 1	0	0	182	182	218	218
Habitat is within 372 ft of a GCW observation (radius of a 10-acre circle around each point)	2 : 1	0	0	661	1,322	181	362
Habitat patch containing at least 250 ac has a GCW density of ≥ 5 territories/100 ac of suitable habitat	3 : 1	2,023	6,069	0	0	0	0
Total		2,023	6,069	863	1,504	399	580
Overall Mitigation Ratio			3.0 : 1		1.7 : 1		1.5 : 1

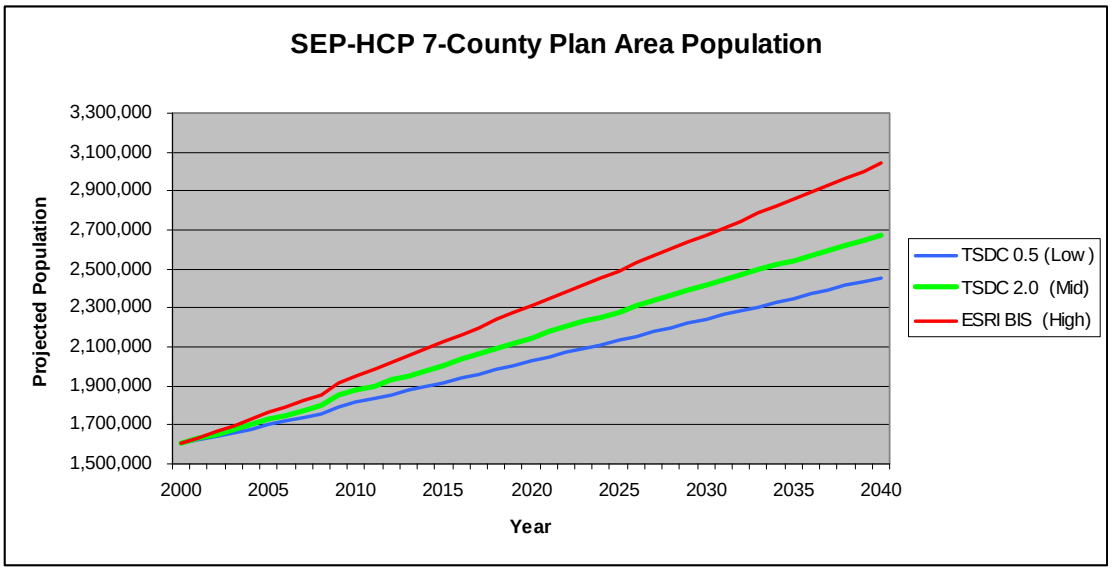
Option 2: Habitat Patch Size

Impacted Habitat	Mitigation Ratio	Property 1 – exceptional GCW habitat		Property 2 – generally average GCW habitat		Property 3 – low to average GCW habitat	
		Acres	Required Mitigation (acres)	Acres	Required Mitigation (acres)	Acres	Required Mitigation (acres)
Suitable habitat in patches of less than 500 acres	1 : 1	0	0	37	37	19	19
Suitable habitat in patches of between 500 and 1,000 acres	2 : 1	0	0	0	0	0	0
Suitable habitat in patches of at least 1,000 acres	3 : 1	2,023	6,069	826	2,478	381	1,143
Total		2,023	6,069	863	2,515	400	1,162
Overall Mitigation Ratio			3.0 : 1		2.9 : 1		2.9 : 1

** all mitigation ratios are expressed as mitigation : impact*

SEP-HCP PRELIMINARY IMPACTS ANALYSIS SUMMARY

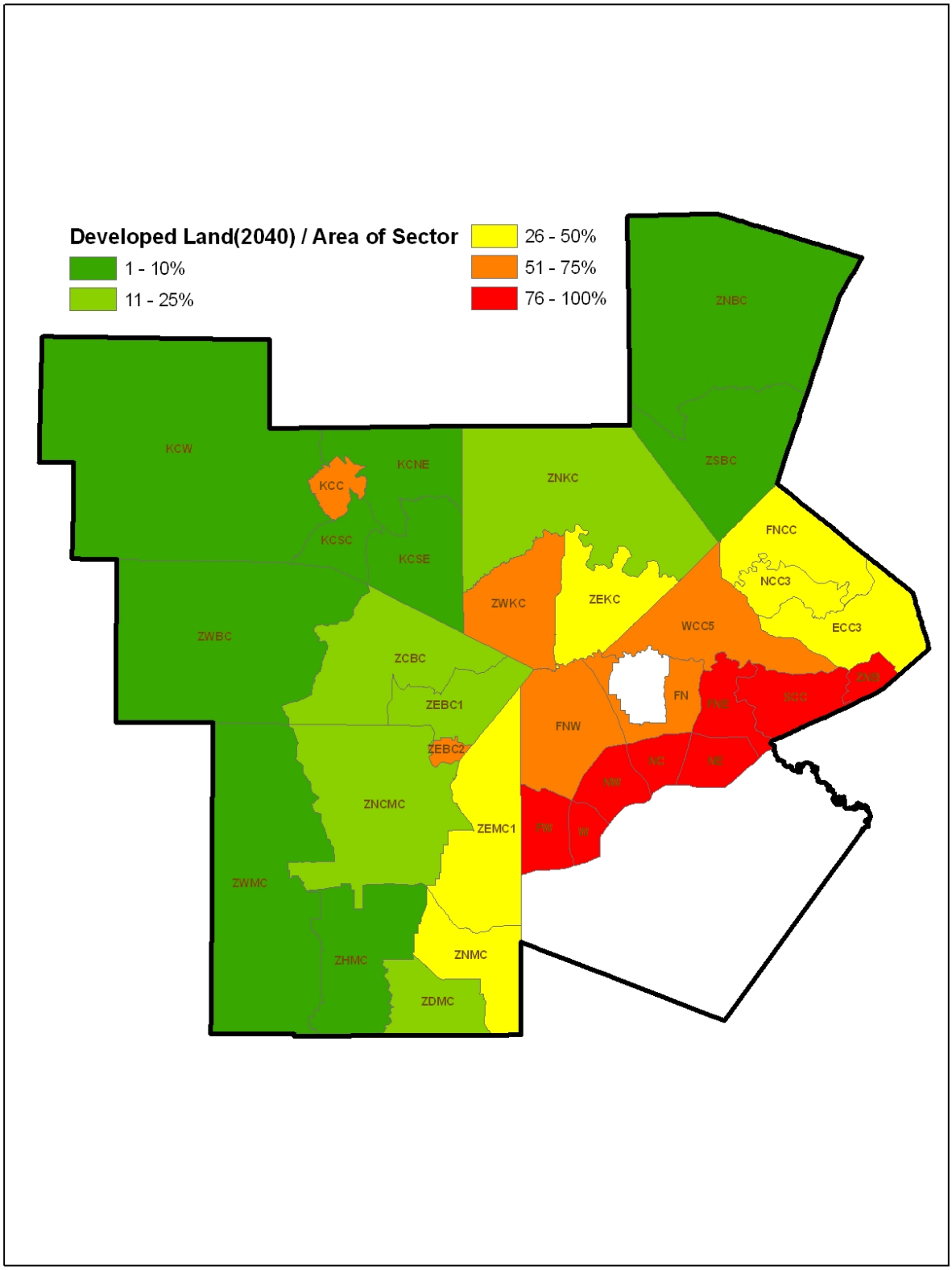
Projected Population Growth



Land Development Projections – Revised Version

Revisions included increasing the target density for single-family residential development in some areas (has the effect of reducing the amount of land development needed to accommodate the population increase) and more evenly distributing projected development over time.

County	Area of LU Sectors (ac)	Acres of New Development				Total Acres of New Development 2010 - 2040
		2000 - 2009	2010 - 2020	2020 - 2030	2030 - 2040	
Bandera	510,319	6,538	3,176	4,104	7,972	15,252
Bexar	300,101	64,163	48,859	41,692	596	91,147
Blanco	456,589	677	495	727	3,502	4,724
Comal	367,673	45,387	18,227	21,978	46,619	86,824
Kendall	424,289	22,663	6,009	12,582	25,011	43,602
Kerr	708,840	5,336	2,221	3,770	5,874	11,865
Medina	853,888	11,622	3,652	9,173	9,428	22,253
TOTAL	**3,621,699**	**156,386**	**82,639**	**94,026**	**99,002**	**275,667**
w/o Comal	**3,254,026**	**110,999**	**64,412**	**72,048**	**52,383**	**188,843**


Developed Land(2040) / Area of Sector
1 - 10%
11 - 25%
26 - 50%
51 - 75%
76 - 100%
ZNBC
KCW
KCNE
KCC
ZNKC
ZSBC
KCSC
KCSE
FNCC
NCC3
ZWKC
ZEKC
ECC3
ZWBC
WCC5
ZCBC
FN
ZEBC1
FNW
ZEBC2
NC
NW
ZNCMC
ZEMC1
FW
W
ZWMC
ZHMC
ZNMC
ZDMC

Estimated GCW Habitat Loss – Model L (Revised)

County	Potential GCW Habitat in 2000 (ac)*			Estimated GCW Habitat Loss 2010 – 2040 (ac)			
	Low Estimate	Mid Estimate	High Estimate	Low Estimate	Mid Estimate	High Estimate	Average Annual Loss (Mid)
Bandera	103,919	218,963	244,466	2,131	5,519	6,502	184
Bexar	52,069	92,785	99,880	13,546	24,487	26,508	816
Blanco	20,591	79,526	113,754	195	969	1,344	32
Comal	72,016	157,961	173,950	16,194	36,949	40,454	1,232
Kendall	18,778	80,371	112,133	3,822	12,072	14,978	402
Kerr	83,755	201,368	234,591	610	2,785	3,442	93
Medina	73,527	113,833	121,440	2,381	3,135	3,249	105
TOTAL	**424,655**	**944,807**	**1,100,214**	**38,879**	**85,916**	**96,477**	**2,864**
w/o Comal	**352,639**	**786,846**	**926,264**	**22,685**	**48,967**	**56,023**	**1,632**

* GCW habitat estimates based on Loomis GCW Habitat Model:

- Low Estimate = Potential habitat of any quality class that is **Likely To Be Occupied**
- Mid Estimate = Potential habitat of any quality class that **May Be** or is **Likely To Be Occupied**
- High Estimate = Complete Loomis Model - **all quality and occupancy** classes (including habitat that is **Not Likely To Be Occupied**)

Estimated GCW Habitat Loss – Model C (Revised)

County	Potential GCW Habitat in 2000 (ac)*			Estimated GCW Habitat Loss 2010 – 2040 (ac)			
	Low Estimate	Mid Estimate	High Estimate	Low Estimate	Mid Estimate	High Estimate	Average Annual Loss (Mid)
Bandera	140,569	190,171	259,717	3,429	4,855	7,084	157
Bexar	68,933	85,839	108,610	17,787	22,488	28,563	726
Blanco	35,959	60,448	110,562	335	656	1,302	21
Comal	79,487	113,032	165,986	20,016	27,494	39,699	887
Kendall	49,258	77,547	136,837	7,604	11,113	17,374	359
Kerr	111,601	166,589	258,965	1,350	2,256	3,923	73
Medina	96,471	122,862	154,116	2,701	3,249	3,837	105
TOTAL	**582,278**	**816,488**	**1,194,793**	**53,222**	**72,111**	**101,782**	**2,326**
w/o Comal	**502,791**	**703,456**	**1,028,807**	**33,206**	**44,617**	**62,083**	**1,439**

* GCW habitat estimates based on Diamond (2007) Model C:

- Low Estimate = Rank 4 Habitat
- Mid Estimate = Rank 3 and Rank 4 Habitat
- High Estimate = Ranks 1 - 4

Estimated BCV Habitat Loss (Revised)

County	BCV Habitat Estimate (ac)*	Estimated BCV Habitat Loss 2010 – 2040 (ac)	Ave Annual BCV Habitat Loss 2010 – 2040 (ac)
Bandera	7,599	7,599	227
Bexar	47,854	47,854	5,425
Blanco	2,275	2,275	24
Comal	3,591	3,591	848
Kendall	4,945	4,945	509
Kerr	53,074	53,074	889
Medina	62,292	62,292	1,621
TOTAL	**181,630**	**9,543**	**308**
TOTAL w/o Comal	**178,039**	**8,695**	**281**

- As reported in Wilkins et al. (2006)

Estimated Karst Invertebrate Habitat Loss (Revised)

County	Sector	KFR Area	Estimated Number of Species Caves - Zones 1 and 2	Estimated Number of Species Caves - Zones 3 and 4	Karst Zone 1 & 2 Impacts 2010 - 2040	Karst Zone 3 & 4 Impacts 2010 - 2040	Estimated Number of Species Caves Affected by Development (2010 - 2040)	% of Total Est. Caves
Bandera	ZEBC1	Northern KFRs	-	-	-	23	0	0%
Bandera	ZEBC2	Northern KFRs	-	-	-	30	0	0%
Bexar	FN	Northern KFRs	97	-	8,561	4,098	11	11%
Bexar	FNE	Northern KFRs	132	-	12,843	4,012	16	12%
Bexar	FNW	Northern KFRs	176	2	10,301	9,511	13	7%
Bexar	FW	Culebra Anticline	15	-	8,777	10,637	11	75%
Bexar	NC	Northern KFRs	38	1	2,142	3,594	3	7%
Bexar	NE*	Northern KFRs	16	1	1,958	9,039	3	15%
Bexar	NE*	Alamo Heights	6	-	-	-	-	0%
Bexar	NW	Northern KFRs	10	1	723	8,580	1	9%
Bexar	W	Culebra Anticline	6	-	2,357	3,342	3	51%
Medina	ZEMC1	Northern KFRs	103	1	2,261	2,737	3	3%
Medina	ZNCMC	Northern KFRs	-	-	1	-	0	0%
Bexar	SOUTH	Alamo Heights	5	-	531	3,533	1	14%
SEP KARST REGION			**604**	**6**	**50,456**	**59,135**	**65**	**11%**