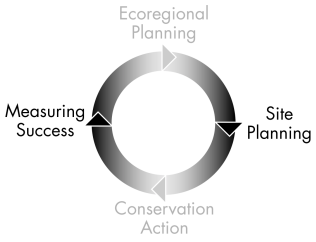
The Five-S Framework *for* Site Conservation

Appendices



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The Nature Conservancy®
Saving the Last Great Places

The Five-S Framework for Site Conservation:

A Practitioner's Handbook for Site Conservation Planning and Measuring Conservation Success

The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

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Table of Contents

Practitioner's Handbook

Appendices

Appendix A

A Step-by-Step Approach to Systems, Stresses, Sources, and Measures of Conservation Success

Systems/Biodiversity Health
Instructions

Use the attached *Systems Viability Worksheet* (see the *Illustrative Example*); or use the analogous automated worksheet template on the Viability sheet of the Microsoft Excel workbook entitled *Site Conservation/Measures of Conservation Success Workbook*.

IDENTIFY THE SYSTEMS.

Select **no more than eight** systems (i.e., focal conservation targets) to be the focus of planning and measuring success. See Appendix B (*Descriptions and Illustrative Examples of Systems*) for examples and worksheets.

The steps for identifying focal conservation targets (as described in Chapter IV) include:

1. Define the ecological systems and species groups (coarse, intermediate, and local scale, as appropriate) that occur at the site.
   A. Identify all ecological systems that characterize the terrestrial, aquatic, and marine components of the site, as appropriate (i.e., top-down approach).
   B. Consolidate individual species and ecological communities into major groupings and ecological systems, respectively (i.e., bottom-up approach).
2. Identify specific ecological communities, species, or species groups that occur at the site and have ecological attributes or conservation requirements not adequately captured within the previously defined ecological systems or species groups.
   A. Individual species or species groups that disperse, travel, or otherwise use resources across different ecological systems.
   B. Important attributtes of regional-scale species (or species groups) that should be conserved at the site.
   C. Individual species and ecological com-munities that have special conservation or management requirements.
3. Of the conservation targets identified through the first two steps, identify the eight that best meet the following criteria:
   - Reflect ecoregional conservation goals
   - Represent the biodiversity at the site
   - Are highly threatened
4. Check the list of eight focal conservation targets to ensure that all biodiversity targets identified

through ecoregional planning are adequately represented, and revise the focal targets as warranted.

ASSESS THE VIABILITY OF THE FOCAL CONSERVATION TARGETS.

Rank each focal target for *size*, *condition*, and *landscape context*, using the following scale:

- "Very Good" or 4.0
- "Good" or 3.5
- "Fair" or 2.5

  "Poor" or 1.0

The ranking of size, condition, and landscape context should be based on global EO rank specifications, if available, or otherwise on site-specific specifications, as described in Chapter IV of the handbook. If desired, size, condition, and landscape context can be weighted on a scale of 1.0, 0.75, 0.5, and 0.

It is important to document the rationale for the size, condition, and landscape context rankings you assign, and what changes would have to occur for the assigned rank to be upgraded or downgraded by one rank. The *Systems Viability Worksheet* of the Excel workbook has fields for including this documentation.

For each focal target, compute the average value of the numeric scores for size, condition, and landscape context. The simple average is used when all factors have equal weight; a weighed average is used if the factors have unequal weight. Determine the viability rank using the following table:

>= 3.75	Very Good
3.0 – 3.74	Good
1.75 – 2.99	Fair
< 1.75	Poor

(Note: the viability rank, based on size, condition, and landscape context, is computed automatically in the Systems Viability Worksheet *of the Excel workbook.)*

DETERMINE BIODIVERSITY HEALTH FOR THE SITE.

Assign a numeric score to the viability rank for each target: Very Good=4.0, Good=3.5, Fair=2.5, Poor 1.0. Compute the simple average of the scores and assign Biodiversity Health based on the average, using the same table as in the previous step.

(Note: the average viability score is computed and Biodiversity Health assigned automatically in the Systems Viability Worksheet *of the Excel workbook.)*

Systems Worksheet

Site _____

List conservation targets (no more than eight). For each target, record the rank and numerical score (and weighting, where appropriate) for size, condition, landscape context, and viability.

Ranks are Very Good=4.0; Good=3.5; Fair=2.5; Poor=1.0.

Weighting of size, condition, and landscape context should be 1.0, 0.75, 0.50, or 0; default weight is 1.0.

Conservation Target	Size	Wt.	Condition	Wt.	Landscape Context	Wt.	Viability Rank

AVERAGE VIABILITY SCORE = _____

BIODIVERSITY HEALTH = _____

The average viability score across all targets is converted to Biodiversity Health based on the following matrix:

>= 3.75	Very Good
3.0 – 3.74	Good
1.75 – 2.99	Fair
< 1.75	Poor

Systems Worksheet—Illustrative Example

Site *Agate Desert, OR*

List conservation targets (no more than eight). For each target, record the rank and numerical score (and weighting, where appropriate) for size, condition, landscape context, and viability.

Ranks are Very Good=4.0; Good=3.5; Fair=2.5; Poor=1.0.

Weighting of size, condition, and landscape context should be 1.0, 0.75, 0.50, or 0; default weight is 1.0. (*See documentation information in Excel spreadsheet for rationale of individual rankings*)

Conservation Target	Size	Wt.	Condition	Wt.	Landscape Context	Wt.	Viability Rank
Vernal pools/mounded prairie	G (3.5)	1	F (2.5)	1	F (2.5)	1	Fair
Vernal pool fairy shrimp	F (2.5)	1	F (2.5)	.75	F (2.5)	1	Fair
Lomatium cookii	F (2.5)	1	F (2.5)	1	F (2.5)	1	Fair
Limanthes species	F (2.5)	1	F (2.5)	1	F (2.5)	1	Fair
Chaparral	F (2.5)	1		0	P (1.0)	1	Fair
Pine - Oak	F (2.5)	1		0	F (2.5)	1	Fair

AVERAGE VIABILITY SCORE = 2.5

BIODIVERSITY HEALTH = Fair

The average viability score across all targets is converted to Biodiversity Health based on the following matrix:

>= 3.75	Very Good
3.0 – 3.74	Good
1.75 – 2.99	Fair
< 1.75	Poor

Stresses
Instructions

Use the enclosed *Stresses/Sources Worksheet* (refer to the *Illustrative Example*); or use the analogous automated worksheet templates in each of the eight individual conservation target sheets of the Microsoft Excel workbook entitled *Site Conservation/Measures of Conservation Success Workbook*. Prepare one work-sheet for focal conservation target.

LABEL THE WORKSHEET with the name of the site, and the conservation target (taken from the Systems worksheet; *this is done automatically in the Excel workbook*) and provide a brief description of the system.

IDENTIFY THE STRESSES TO EACH SYSTEM.

In the Stress table, list **up to eight** stresses for each system. You do not need to include every conceivable stress, but only those which are current (or likely to become a problem within the next ten years), proximate, and cause particular concern. Avoid listing stresses to a given system that are largely redundant (e.g. habitat destruction; habitat fragmentation; habitat degradation). Use the *Illustrative List of Stresses* in Appendix C as an aide, but also please consider other stresses that may be relevant and significant.

RANK THE STRESSES.

Rank each stress you identified according to the following scale of significance:

- "Very High"
- "High"
- "Medium"
- "Low"

Please rank each stress based on an assessment of both severity and scope. The attached *Stress Ranking Guidelines* provide a set of benchmarks for ranking the severity and scope of stresses. The set of rules for determining a stress ranking, as a function of severity and scope, is also provided in table form. (*Note: the stress rank, based on severity and scope, is computed automatically in the* Stresses/Sources Worksheets *of the Excel worksheet.*)

It is important to document the rationale for selecting stresses, and for the severity and scope rankings you assign. The *Stresses/Sources Work-sheets* of the Excel workbook have fields for including this documentation. See Appendix C for examples.

Stress Ranking Guidelines

Severity of Damage — *What level of damage over at least some portion of the target occurrence can reasonably be expected within 10 years under current circumstances (given the continuation of the existing management/conservation situation)*	
Very High	The stress is likely to *destroy or eliminate* the conservation target over some portion of the target's occurrence at the site
High	The stress is likely to *seriously degrade* the conservation target over some portion of the target's occurrence at the site
Medium	The stress is likely to *moderately degrade* the conservation target over some portion of the target's occurrence at the site
Low	The stress is likely to *only slightly impair* the conservation target over some portion of the target's occurrence at the site

Scope of Damage — *What is the geographic scope of impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstances (given the continuation of the existing situation)*	
Very High	The stress is likely to be *very widespread or pervasive in its scope*, and affect the conservation target *throughout the target's occurrences* at the site
High	The stress is likely to be *widespread in its scope*, and affect the conservation target at *many of its locations* at the site
Medium	The stress is likely to be *localized in its scope*, and affect the conservation target at *some of the target's locations* at the site
Low	The stress is likely to be *very localized in its scope*, and affect the conservation target at a *limited portion of the target's location* at the site

Stress Ranking Table

↓ ***SEVERITY***	***SCOPE***			
	Very High	**High**	**Medium**	**Low**
Very High	Very High	High	Medium	Low
High	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
Low	Low	Low	Low	—

Sources of Stress
Instructions

Use the enclosed *Stresses/Sources Worksheets* you have prepared for each system (refer to the *Illustrative Example*); or use the analogous automated worksheets each of the individual conservation target pages of the Microsoft Excel workbook entitled *Site Conservation/Measures of Conservation Success Workbook*.

LIST THE STRESSES TO THE SYSTEM.

As column headings in the Sources of Stress table, list the stresses to the conservation target from the Stresses table in the previous step. (*This is done automatically in the Excel worksheet*)

IDENTIFY THE SOURCES FOR EACH STRESS.

In the Sources of Stress table, list **up to eight** sources for the stresses to each system. Use the *Illustrative List of Sources* in Appendix C as an aide, but also please consider other sources that may be relevant and significant and cause particular concern. (*Note: a source may contribute to more than one stress.*) Also, indicate whether the source is "active" (i.e., expected to contribute *additional* stress to the conservation target within the next ten years) or "historical" (i.e., expected to contribute *no additional* stress to the conservation target wihin the next ten years).

RANK THE SOURCES.

Rank each source you identified according to the following scale of significance:

- "Very High"
- "High"
- "Medium"
- "Low"

Please rank each source based on an assessment of both contribution and irreversibility. The attached *Sources-of-Stress Ranking Guidelines* provide a set of benchmarks for ranking the contribution and irreversibility of a source to a stress. If a source does not contribute to a stress, leave the cell blank. The set of rules for determining the Source rank, as a function of contribution and irreversibility, is also provided in table form. (*Note: the Source rank, based on contribution and irreversibility, is determined automatically in the* Stresses/Sources Worksheets *of the Excel workbook.*)

It is important to document the rationale for selecting sources of stress, and for the contribution and irreversibility rankings you assign. The *Stresses/SourcesWorksheets* of the Excel workbook have fields for including this documentation. See Appendix C for examples.

DETERMINE THREAT RANK FOR EACH SOURCE-STRESS COMBINATION.

A Threat rank for each stress-source combination is determined based on the individual Stress and Source ranks. The Threat rank may be lower than or equal to, but not higher than, the Stress rank, i.e., the Stress rank serves as an upper limit for the Threat rank. For example, a "Very High" source of a "Medium" stress is only considered a "Medium" threat. The *Individual Threat Ranking Guidelines*

(page A-10) provide the set of rules, in table form, for ranking individual threats based on Stress and Source ranks. (*Note: the Individual Threat ranks, based on Stress and Source ranks, are determined automatically in the Excel worksheet*).

ENTER A THREAT-TO-SYSTEM RANK.

The Threat-to-System rank is the summary ranking of all threats associated with a particular source of stress for a conservation target. Each Threat-to-System rank summarizes the individual threat ranks shown in each stress column. The Threat-to-System rank is found in the far right column of the "Sources of Stress" table in each of the Stresses-Sources-Strategies worksheets. You can use the Threat-to-System Ranking Guidelines (pg. A-10) as an aide to determine these ranks manually.

Note: Threat-to-System Ranks are determined automatically in the Stresses-Sources-Strategies worksheets of the Excel workbook.

Source-of-Stress Ranking Guidelines

Contribution — *Expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/conservation situation)*	
Very High	The source is a *very large* contributor of the particular stress
High	The source is a *large* contributor of the particular stress
Medium	The source is a *moderate* contributor of the particular stress
Low	The source is a *low* contributor of the particular stress

Irreversibility — *Reversibility of the stress caused by the source of stress*	
Very High	The source produces a stress that is not reversible, for all intents and purposes (e.g. wetland converted to shopping center)
High	The source produces a stress that is reversible, but not practically affordable (e.g. wetland converted to agriculture)
Medium	The source produces a stress that is reversible with a reasonable commitment of additional resources (e.g. ditching and draining of wetland)
Low	The source produces a stress that is easily reversible at relatively low cost (e.g. ORVs trespassing in wetland)

Source Ranking Table

↓ ***IRREVERSIBILITY***	***CONTRIBUTION***			
	Very High	**High**	**Medium**	**Low**
Very High	Very High	High	High	Medium
High	Very High	High	Medium	Medium
Medium	High	Medium	Medium	Low
Low	High	Medium	Low	Low

Individual Threat Ranking Guidelines

Determine the Individual Threat Rank for each Stress-Source combination, based on the following table:

		SOURCE			
		Very High	**High**	**Medium**	**Low**
STRESS	**Very High**	Very High	Very High	High	Medium
	High	High	High	Medium	Low
	Medium	Medium	Medium	Low	Low
	Low	Low	Low	Low	—

Threat-to-System Ranking Guidelines

The Threat-to-System rank is determined by combining the individual ranks to which the source contributes using the following rules:

- Threat-to-System rank is never less than the highest Individual Threat Rank associated with a particular source of stress. For example, if any one of the threats associated with a source of stress is ranked Medium, the Threat-to-System rank will be at least Medium.
- *3-5-7 Rule*

  If there are multiple Individual Threat ranks for the same source of stress, the Threat-to-System rank may be adjusted upwards by using the "3-5-7" rule as follows:

Three High ranks equal a Very High	3H = 1VH
Five Medium ranks equal a High	5M = 1H
Seven Low ranks equal a Medium	7L = 1M

For example, assume you have the following Individual Threat ranks associated with a source of stress: two High's and five Medium's. The rules would be used to resolve the Threat-to-System rank as follows:

The Threat-to-System rank must be at least "High". However, you must also determine if the presence of five Medium's elevates the rank. Apply the "3-5-7" rule to find out.

2H + 5M	Given
2H + 1H = 3H	Because 5M = 1H according to the "3-5-7" Rule
= 1VH	Because 3H =1VH according to the "3-5-7" Rule

Yes, five Medium Individual Threat ranks increase the Threat-to-System rank from "High" to "Very High".

Here are some other combinations and their "solutions". If the application of the rule is unclear, try to resolve these:

Individual Threat Ranks	Threat-to System Rank
One Medium and Seven Low's	Medium
Four Medium's and Seven Low's	High
One Very High and Anything	Very High

Stresses/Sources Worksheet

Site _____

Name of System _____

Description:

Stresses

List stresses and provide stress ranks below.

Stress	Severity	Scope	Stress Rank

Note: Sources of Stress continued on next page.

Stresses/Sources Worksheet (page 2): Sources of Stress

COLUMNS: List as column headings the stresses to the system from the Stress table on the previous page.
ROWS: List up to eight sources in the first column. Record Contribution, Irreversibility, and Source ranks (left of divider) and **Threat rank** (right of divider) for each source in the subsequent columns. Threat-to-System rank for each source is recorded in the last column.

Stresses

Sources of Stress										Threat-to-System Rank
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									
	Contribution									
	Irreversibility									
Active/Historical	**Source**									

Stresses/Sources Worksheet—Illustrative Example

Site *Agate Desert, OR*

Name of System Vernal pools/mounded prairie

Description:

Stresses

List stresses and provide stress ranks below.

Stress	Severity	Scope	Stress Rank
Habitat destruction or conversion	Very High	High	**High**
Altered composition/structure	High	High	**High**
Extraordinary competition for resources	High	High	**High**
Habitat disturbance	High	Medium	**Medium**
Excessive herbivory	High	High	**High**
Nutrient loading	Medium	Medium	**Medium**
Extraordinary predation/disease	Medium	Medium	**Medium**

Note: Sources of Stress continued on next page.

Stresses/Sources Worksheet (page 2): Sources of Stress—Illustrative Example

COLUMNS: List as column headings the stresses to the system from the Stress table on the previous page.
ROWS: List up to eight sources in the first column. Record Contribution, Irreversibility, and Source ranks (left of divider) and **Threat rank** (right of divider) for each source in the subsequent columns. Threat-to-System rank for each source is recorded in the last column.

Sources of Stress		Stresses																Threat-to-System Rank
		Habitat Destruction/ Conversion		Altered Composition/ Structure		Competition for Resources		Habitat Disturbance		Excessive Herbivory		Nutrient Loading		Extraordinary Predation				
Primary home development (Active)	Contribution	M												M				
	Irreversibility	VH	High											M	Low			High
	Source	**H**												**M**				
Commercial/ industrial development (Active)	Contribution	M												L				
	Irreversibility	VH	High											M	Low			High
	Source	**H**												**L**				
Grazing practices (Active)	Contribution			M		M		L		VH		M						
	Irreversibility			M	Medium	M	Medium	L	Low	M	High	L	Low					High
	Source			**M**		**M**		**L**		**H**		**L**						
Fire Suppression (Active)	Contribution			H		M												
	Irreversibility			M	Medium	M	Medium											Medium
	Source			**M**		**M**												
Wetland Fill (Historical)	Contribution	**L**																
	Irreversibility	**H**	Medium															Medium
	Source	**M**																
Invasive/alien species (Active)	Contribution			H		H								H				
	Irreversibility			H	High	H	High							H	Medium			High
	Source			**H**		**H**								**H**				
Wastewater treatment (Active)	Contribution											M						
	Irreversibility											L	Low					Low
	Source											**L**						
Conversion to agriculture (Active)	Contribution	H		H				H										
	Irreversibility	H	High	H	High			H	Medium									High
	Source	**H**		**H**				**H**										

Overall Threat Ranks
Instructions

Use the attached *Threat SummaryWorksheets* (refer to the *Illustrative Example*); or use the analogous worksheet templates on the sum-mary sheet of the Microsoft Excel workbook entitled *Site Conservation/Measures of Conservation Success Workbook*. Note that there is a separate Threat Summary Worksheet for "active" and "historical" sources of stress, respectively. *(Note: all steps described on this page are completed automatically by the* Threat Summary Worksheets *in the Excel workbook.)*

LABEL THE WORKSHEET with the name of the site. Fill in the sources of stress and their Threat-to-System ranks for each system (taken from the Stresses/Sources worksheets). Active sources of stress should be listed in the Threat Summary for Active Sources table; historical sources of stress should be listed in the Threat Summary for Historical Sources table.

DETERMINE OVERALL THREAT RANK FOR EACH SOURCE OF STRESS.

The Overall Threat Rank (far right column of worksheet) for a given source of stress is determined by combining the Threat-to-System ranks for that source across all the identified systems at the site. Overall Threat ranks can be determined manually by applying the following rules.

If a source threatens multiple systems, apply the "3-5-7" rule to aggregate the Threat-to-System ranks of the source. (*See page A-10 for an explanation of this rule*.)

Apply the "2 prime" rule to further aggregate the ranks.

Two Very High threat rankings yield an Overall Threat Rank of Very High
One Very High or two High threat rankings yield an Overall Threat Rank of High
One High or two Medium threat rankings yield an Overall Threat Rank of Medium
Less than two Medium threat rankings yield an Overall Threat Rank of Low

Further description of these rules can be found in the Scoring Worksheet of the Excel spreadsheet.

DETERMINE THE "THREAT STATUS" OF THE SITE.

The Threat Status of the site is determined by applying the *2-Prime Rule*, as described above, to the Overall Threat ranks of the eight highest-ranked active sources.

- On the Summary Worksheet for Active Sources, aggregate the Overall Threat ranks of the eight highest-ranked active sources using the *Prime Rule*: three "High" threats are equivalent to one "Very High" threat; five "Medium" threats are equivalent to one "High" threat; and seven "Low" threats are equivalent to one "Medium" threat.
- Next, examine the aggregated Overall Threat ranks. If there are at least two "Very High" ranks, the Threat Status is "Very High"; at least two "High" ranks (or one "Very High" and one "High"), the Threat Status is "High"; at least two "Medium" ranks (or one "High" and one "Medium"), the Threat Status is "Medium."

Threat Summary Worksheet—Active Sources

Site _____

Fill in the Threat-to-System rank for each System-Source combination, and determine the Overall Threat rank for each Active Source using the 2-Prime Rule.

Sources	System One	System Two	System Three	System Four	System Five	System Six	System Seven	System Eight	**Overall Threat Rank**

Determine Threat Status by applying the 2-Prime Rule to the eight highest-ranked Overall Threats.

Threat Status and Abatement = _____

Threat Summary Worksheet—Historical Sources

Site _____

Fill in the Threat-to-System rank for each System-Source combination, and determine the Overall Threat rank for each Historical Source using the 2-Prime Rule.

Sources	System One	System Two	System Three	System Four	System Five	System Six	System Seven	System Eight	**Overall Threat Rank**

Overall Threats Worksheet—Active Sources: Illustrative Example

Site *Agate Desert, OR*

Fill in the Threat-to-System rank for each System-Source combination, and determine the Overall Thrat rank for each Source using the 2-Prime Rule.

Sources	Vernal pools/ mounded prairie	Vernal pool fairy shrimp.	*Lomatium cookii*	*Limnanthes* species	Chaparral	Pine - Oak			**Overall Threat Rank**
Commercial/industrial development	**High**	**Medium**	**Medium**	**High**	**Medium**	**High**			**High**
Conversion to agriculture or silviculture	**High**	**High**	**Medium**	**High**	**Medium**				**High**
Grazing practices	**High**	**Medium**	**High**	**High**	**Low**				**High**
Primary home development	**High**	**Medium**	**Medium**	**Medium**	**Medium**	**High**			**High**
Invasive/alien species	**High**		**Medium**	**Medium**	**Low**	**Medium**			**Medium**
Fire suppression	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**	**Medium**			**Medium**
Poaching or commercial collecting (snags & logs)						**High**			**Medium**
Wastewater treatment	**Low**	**Low**							**Low**
Log deck debris		**Low**							**Low**

Determine Threat Status by applying the 2-Prime Rule to the eight highest-ranked Overall Threats.

Threat Status and Abatement = High