# Table of Contents

**Kofa National Wildlife Refuge and Wilderness** ................................................................. 3-4
  Kofa NWR and Wilderness Background and Setting .......................................................... 3
  Kofa NWR and Wilderness Map ......................................................................................... 4

**Wilderness Resources** ...................................................................................................... 5-8
  Wilderness Character Monitoring and Qualities ................................................................. 5
  Documents Consulted and Staff Consulted ......................................................................... 6-7
  Process Used to Identify Measures ................................................................................... 8

**Selected Measures** ............................................................................................................ 9-32
  Untrammeled ....................................................................................................................... 9-13
    Actions to Manage Wildlife .............................................................................................. 9-10
    Amount of Water Supplemented to Wildlife Water Sources ............................................ 11
    Human Ignited Fires ......................................................................................................... 12
    Military and Border Patrol Intrusions .............................................................................. 13
  Natural .................................................................................................................................. 14-18
    Desert Bighorn Sheep ....................................................................................................... 14
    Extirpated Plants and Animals .......................................................................................... 15
    Non-Indigenous Species .................................................................................................... 16
    Present Bat Species ........................................................................................................... 17
    Natural Fires Suppressed ................................................................................................... 18
  Undeveloped ...................................................................................................................... 19-27
    Actions to Cleanup Modern Human Debris ..................................................................... 19
    Number of Active, Unpatented Mining Claims in Wilderness .......................................... 20
    Developed/Enhance Wildlife Water Source Structures .................................................... 21-22
    Other Authorized Non-Recreational Physical Development .......................................... 23
    Type and Amount Use of Motor Vehicles, Motorized Equipment, and Mechanical Transport ........ 24
    Incidents and Known Vehicle Intrusions ......................................................................... 25
    Inholdings Acres ............................................................................................................... 26
    Disturbances to Cultural Resources .................................................................................. 27
  Solitude or Primitive and Unconfined Recreation ................................................................. 28-32
    Agency Provided Foot Trails ............................................................................................. 28
    Agency Provided Recreation Facilities .............................................................................. 29
    Camping Restrictions Around Wildlife Water Sources .................................................. 30
    Administrative Travel Routes and Access Roads .............................................................. 31
    Refuge Roads Adjacent to Wilderness .............................................................................. 32

**Measures Not Used** ........................................................................................................... 33-38

**Conclusions** ....................................................................................................................... 39

**Appendix**
Background and Setting

Kofa National Wildlife Refuge (Kofa) was established from public lands on January 25, 1939 by Executive Order 8039 and was “reserved and set apart for the conservation and development of natural wildlife resources.” A primary concern was desert bighorn sheep. The U.S. Fish and Wildlife Service (FWS) and the Bureau of Land Management (BLM) managed the Kofa Game Range (as it was originally known) jointly until February 27, 1976. At that time an amendment to the National Wildlife Refuge Administration Act (P.L. 94-223) awarded sole jurisdiction to the Fish and Wildlife Service and changed the name to Kofa National Wildlife Refuge. The refuge is located in Yuma and La Paz Counties in southwest Arizona (see map on next page).

The Arizona Desert Wilderness Act of 1990 added 5,400 acres of public land (BLM) to the refuge, bringing the total refuge acreage to 664,327 and designating 516,200 acres of that as wilderness.

Two major mountain ranges, the Kofa Mountains and Castle Dome Mountains, dominate the refuge landscape. These rugged mountains are typified by extensive exposures of bedrock, sparse vegetative cover, lack of soil development, and narrow side canyons. Bajadas, or alluvial fans, slope down from the base of the mountains toward the valley floor and are cut by many deep gullies or washes. Elevation varies from 680 feet mean sea level (msl) in King Valley to 4,877 feet msl atop Signal Peak.

The refuge is located in the Sonoran Desert climatic zone that is characterized by long, hot summers; short, mild winters; and low annual rainfall (4–8 inches). The climate pattern consists of winter precipitation followed by spring drought and summer precipitation followed by fall drought.

The area where the refuge is located has a long history of human use. Archeological materials located on the refuge date back to 9000 B.C. Early Spanish explorers visited this part of Arizona by 1540. During the late 1800s and early 1900s, several gold and silver mines were active in the area that is now the refuge. The effects of mining activities on the natural environment are still apparent. The name of the refuge is derived from the King of Arizona gold mine; KOFA being an acronym of that name.
Map of Kofa National Wildlife Refuge and Wilderness - FWS
Wilderness Character Monitoring

Kofa National Wildlife Refuge was part of the initial round in a wilderness character monitoring pilot program influenced by the Wilderness Act of 1964. This program was implemented to provide a uniform approach to monitoring trends and actions in wildernesses across the nation. Along with 18 other USFWS refuges, wilderness character monitoring measures were created for Kofa National Wildlife Refuge Wilderness using a baseline year of 2011. The measures selected for Kofa are specific to this wilderness and unique from any other set of wilderness character monitoring measures. These measures will allow USFWS and interested parties to monitor how the wilderness character will change and trends in the future. Trends in wilderness character monitoring can either be improving, degrading, stable or offsetting stable.

Qualities of Wilderness Character

Untrammeled

“...an area where the earth and its community of life are untrammeled by man...” and “...generally appears to have been affected primarily by the forces of nature” – Wilderness Act of 1964

Wilderness is essentially unhindered and free from the actions of modern human control or manipulation

Natural

“...is protected and managed so as to preserve its natural conditions” – Wilderness Act of 1964

Wilderness ecological systems are substantially free from the effects of modern civilization

Undeveloped

“...an area of undeveloped Federal land...without permanent improvement or human habitation” and “...where man himself is a visitor who does not remain” – Wilderness Act of 1964

Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation

Solitude or primitive and unconfined recreation

“...has outstanding opportunities for solitude or a primitive and unconfined type of recreation“ – Wilderness Act of 1964

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation
Documents Consulted

The documents listed below were the main sources used to help identify measures as well as supplied data for some of the measures:

*Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment – USDOI - October 1996*
Located in the Kofa library, this document is the Plan that provides long-term management guidance for the Kofa NWR and Wilderness. This document was useful to get an overview of the goals, maps, and a good background on Kofa. It also has a comprehensive list of flora and fauna found on Kofa as well as a list of some of the wildlife water sources.

*Kofa National Wildlife Refuge Annual Narrative Reports – Years 1991-2011*
These documents were most useful to help identify measures by getting an idea of what activities go on at the refuge year after year. Started the year of wilderness designation and continued to the most current information available for 2011. Very good sources for data: number of bighorn sheep, amount of water hauled, and some unauthorized actions can generally be found in annual narratives. Big projects like wildlife water source installations and cleanups can sometimes be found in these documents also.

*Kofa National Wildlife Refuge Water Attributes – Prepared by Nancy and Everett Collin - 2000*
Located in Refuge Manager, Susanna Henry’s office, this blue binder has an almost comprehensive report from 2000 of the wildlife water attributes on Kofa. Water catchment type, location, other structures as well as pictures can all be found in the document. Great source for identifying man-made water attributes, their condition, and impact on wilderness.

*Cultural Resource Overview and Assessment of the Kofa NWR – Tiffany C. Clark – 2004-2006*
Located in the Kofa Library, this document was used to identify and get an overview of the cultural resources found on Kofa.

Other Documents Consulted

*Keeping it Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System – Peter Landres and Others – July 2008*

*Technical Guide for Monitoring Selected Conditions Related to Wilderness Character- Peter Landres and Others – June 2009*
**Staff Consulted**

Elaine Johnson, Project Leader  
Bill Seese, Deputy Refuge Manager  
Susanna Henry, Refuge Manager  
Brenda Zaun, Zone Biologist  
Cixto Saucedo, Maintenance and Operations  
John Morris, Bio-Technician  
Drew Cyprian, Law Enforcement  
Benji Stewart, Fire Operations Specialists  
Candy Holzer, Bureau of Land Management  
Arizona Game and Fish Department

Wilderness Fellow, Kelly L. Lockman, above Hidden Valley Tank in Kofa Wilderness  
Photo: Molly McCarter
Process Used for Identifying Measures

Steps to identify measures:

1. Meet with key refuge staff members like the Refuge Manager and give a brief overview of the WCM project. Locate important documents like the CCP, Annual Narratives (starting from year of wilderness designation), related documents, maps and important contacts.

2. Read important documents to get a better understanding of the goals of the refuge and wilderness as well as the operations/occurrences that repetitively happen at the refuge. This may also help identify measures that are not only important to WCM but may not require the staff to do a great deal of extra work to collect data after you leave.

3. Setup a day when a knowledgeable staff member is available to give a tour of the wilderness. Record observations in the field as well as comments by staff. This will also allow you more time to discuss possible wilderness issues that could translate into a measure. This time with the staff member is very valuable; ask many questions.

4. Compile a draft of possible measures. Participate in refuge activities to get a better understanding to what is important to staff. Since it is recommended to only have approximately 25 final measures, try to identify the most influential measures on wilderness character that not only fulfill the indicator but also account for different aspects in wilderness and data is readily available or easy to gather by staff members.

5. Setup a date and time to meet with staff to discuss the possible measures. Try not to say: “When you have time, may we go over this?” or any other similar vague statement. Try to get the staff member to open up their calendars and pencil in on a specific date and time like: “3 o’clock on Thursday.” Getting penciled in will increase the chances of the meeting actually happening and not being pushed back say a week. So many activities go on at refuges; WCM may not be made a priority.

6. At the meeting ask where data can be found for each well received and feasible measure. This may or may not help you find this year’s data. Most times, unless it is the end of the year, the data is still being collected for some of the measures.

7. Analyze the revised measure handout to see if what goes on in the wilderness has been captured with the approximate selection of 25 measures. Also make sure that data can be easily collected and monitored by refuge staff after you leave. If you are comfortable with the list, then create a final list to show the key staff members. This meeting should also include your suggestions for: frequency, unit of measure, weight, significant change, description and data source for each measure for comment. Make a suggestion for each because it is easier for staff to comment on something rather than a blank document.

8. Enter measures, related information and available data into database.
**Selected Measures**

**Character:** Untrammeled  
**Indicator:** Actions authorized by refuge manager that manipulate the biophysical environment  
**Measure:** Actions to Manage Wildlife

**Description:** A point system of authorized actions to manage wildlife in wilderness. Actions include but are not limited to: species surveys in wilderness that disrupt natural routine and removal/dispatching of wildlife.

1a. Bat and bird mist netting surveys  
(Count/Year)  
Each survey = 1 action  
1 action = 1 point

1b. Removal of Mountain Lion (Count/Year)  
Each specimen removed = 1 action  
1 action = 4 points

1c. Transplant of Bighorn Sheep (Count/Year)  
Each specimen transplanted = 1 action  
1 action = 2 points

1d. Collaring/Capturing Bighorn Sheep  
(Number/Year)  
Each specimen collared/captured = 1 action  
1 action = 1 point

**Context:** This measure is to exhibit that management actions to wildlife happen in Kofa Wilderness even after designation. This measure is to capture a wide range of actions that happen throughout a given year. Bat and bird mist netting surveys as well as collaring of Bighorn Sheep disrupts the natural routine of these species. Removal of Mountain lions disrupts the natural link in the food web as well as transplanting of Desert Bighorn Sheep. The point system was given to rank the severity of each action. This trend could reflect degrading, improving, or stable depending on the actions of the management staff. These management actions do not appear to cease in the near future, but it is important to document these actions because they do trammeled the wilderness.

**Data Sources:**  
Susanna Henry, Refuge Manager  
John Morris, Bio-technician  
Arizona Game and Fish Department  
*Annual Narrative Reports*
Process Used to Compile/Gather Data: Conversations with refuge staff because most of these actions are still going on throughout the year and are not put into the Annual Narrative Reports or other documents until after the year is over. Most of this information is on their personal computers or in their own files.

Significant Change: The significant change for this measure is “Any”. For this measure there is a point system that makes finding the significant change more complex. The point system takes into account the severity of each action. For example, if in Year A there are 2 removal of Mountain Lions (4 points each) =8 and the Year B there are 4 mist net surveys (1 point each) =4, Year A would be less number of actions but the severity of the actions are greater thus reflecting a greater degradation than Year B.

Data Adequacy: High confidence in data. All actions are well documented and either one, some or all the actions to manage wildlife will happen each year on Kofa wilderness for the foreseeable future.

Desert Bighorn Sheep with collar near water source

Photo: FWS
**Character:** Untrammeled  
**Indicator:** Actions authorized by refuge manager that manipulate the biophysical environment  
**Measure:** Amount of Water Supplemented to Wildlife Water Sources

**Description:** Cumulative annual amount of gallons of water hauled to wildlife water sources in wilderness

**Context:** A large aspect of the management actions on Kofa is supplying water to sources throughout the refuge and wilderness. The less it rains on Kofa, the more water that has to be hauled to these sources to help Desert Bighorn Sheep as well as other species on Kofa survive the harsh environment. The actions of bringing water into these areas manipulate the natural system.

**Data Sources:**  
Susanna Henry, Refuge Manager  
Cixto Saucedo, Maintenance and Operations  
*Annual Narrative Reports*

**Process Used to Compile/Gather Data:** Conversations with key refuge staff because most of these actions are still going on throughout the year and are not put into the Annual Narrative Reports or other documents until after the year is over. Most of this information is on their personal computers or in their own files. Legacy data can be found in many of the Annual Narrative Reports but not in all.

**Significant Change:** Take the average of the current year plus the last 15 years of water hauling data to find the mean. Any number 10,000 above the mean, it will reflect a degrading trend. If the average is 10,000 below, it will reflect an improving trend. Any total in between the 10,000 gallon threshold is stable.

**Data Adequacy:** High confidence in data. All water hauls and amounts are well documented and will happen each year on Kofa wilderness for the foreseeable future. The formula to find significant change is important because water hauling will always be an action when necessary for species survival.
Character: Untrammeled
Indicator: Actions not authorized by refuge manager that manipulate the biophysical environment
Measure: Human Ignited Fires

Description: Number of known and documented human/visitor ignited fires in wilderness

Context: Past large fires can be contributed to accidental and purposeful ignited fires by visitors to Kofa wilderness. Some instances involve campfires that escape and other incidents property, particularly cars, are set on fire and left in wilderness areas.

Data Sources:
Susanna Henry, Refuge Manager
Benji Stewart, Fire Operations Specialist
Law Enforcement

Process Used to Compile/Gather Data: Conversations with key refuge staff because most of these actions are still going on throughout the year and are not put into the Annual Narrative Reports or other documents until after the year is over. Most of this information is on their personal computers or in their own files. Legacy data can be found also by asking key data sources.

Significant Change: The significant change for this measure is “Any”. If the amount of human/visitor ignited fires were to increase in a given year, it will reflect a degrading trend. If the amount of human ignited fires were to decrease, it would reflect an improving trend. A change in the amount of human/visitor ignited fires will have a significant change on the biophysical environment

Data Adequacy: Medium confidence in data. Kofa Wilderness is enormous and some human/visitor ignited fires will be missed in the data counts.
**Character:** Untrammeled  
**Indicator:** Actions not authorized by refuge manager that manipulate the biophysical environment  
**Measure:** Military and Border Patrol Intrusions  

**Description:** Number of known and documented military and border patrol intrusions that manipulate the biophysical environment  

**Context:** The proximity of the Yuma Proving Grounds and the USA/Mexico Border creates heavy activity from both military and border patrol. When the military practice does not go as planned, sometimes an item (i.e. missile, parachute, plane) lands in wilderness and they must retrieve it. For the border patrol, a lot of illegal activities happen along the border and at times they must intrude on wilderness. These organizations contact refuge staff and the staff may offer a less invasive means to complete their task but in the end it is up to military and border patrol discretion.  

**Data Sources:**  
Susanna Henry, Refuge Manager  
Law Enforcement  

**Process Used to Compile/Gather Data:** Conversations with key refuge staff because most of these actions are still going on throughout the year and are not put into the Annual Narrative Reports or other documents until after the year is over. Most of this information is on their personal computers or in their own files.  

**Significant Change:** The significant change for this measure is “Any”. The more intrusions that happen in wilderness, the more degrading it is to the biophysical environment. If there are a less amount of intrusions than the previous year, this will reflect an improving trend.  

**Data Adequacy:** Medium confidence in data. Military and Border Patrol should report these actions to refuge staff, but they do not fall under the same protocol as refuge staff in regards to wilderness jurisdiction.
Character: Natural  
Indicator: Plant and animal species and communities  
Measure: Desert Bighorn Sheep

Description: Annual population estimates of Bighorn Sheep from aerial and group surveys. Desert Bighorn Sheep population estimates are derived using the Kofa Group Size Estimator.

Context: Desert Bighorn Sheep are part of the refuge’s establishing purposes and the population size is frequently monitored by refuge staff. The population size from year to year can give a glimpse into the stability and health of the ecosystem in the wilderness.

Data Sources:
Susanna Henry, Refuge Manager  
Annual Narrative Reports

Process Used to Compile/Gather Data: Conversations with key refuge staff because most of these actions are still going on throughout the year and are not put into the Annual Narrative Reports or other documents until after the year is over. Most of this information is on their personal computers or in their own files. Legacy data can be found in the Annual Narrative Reports. In 2011, a population survey will not take place in order to save money to purchase new monitoring collars.

Significant Change: The significant change is 10%. 10% less than previous year reflects a degrading trend. 10% more than previous year reflects an improving trend. Less than 10% either way reflects a stable trend. Since 2011 survey will not be conducted, 2012 population size data should reflect a stable trend and the significant change to find out the trend should be calculated in 2013 or the next year a population size survey is conducted for Desert Bighorn Sheep.

Data Adequacy: High Confidence in data. Data collected by knowledgeable staff and the Kofa Group Size Estimator is a very reliable formula to estimate the population size for Desert Bighorn Sheep.
Character: Natural  
Indicator: Plant and animal species and communities  
Measure: Extirpated Plants and Animals

Description: Number of indigenous plant and animal species that have been extirpated based on time from European contact.

Context: The Sonoran Pronghorn was the only species that has been extirpated identified by refuge staff and AGFD. The Pronghorn is to be reintroduced to Kofa NWR December 2011. A pen is being built on refuge land and once the Pronghorn has been successfully released into Kofa Wilderness, it will no longer be counted as an extirpated species.

Data Sources:
Susanna Henry, Refuge Manager  
Arizona Game and Fish Department

Process Used to Compile/Gather Data: Conversations with key refuge staff and Arizona Game and Fish Department.

Significant Change: Any. If an extirpated species is reintroduced successfully to the Kofa wilderness, it will reflect an improving trend. Any additions to the list of extirpated species will reflect a degrading trend.

Data Adequacy: Medium Confidence in data. Most of the data is by word of mouth. Documents could not be located that lists extirpated species. Not totally certain if the Sonoran Pronghorn is the only extirpated species from Kofa.
Character: Natural
Indicator: Plant and animal species and communities
Measure: Non-Indigenous Species

Description: Number of non-indigenous species found in wilderness.

Context: Non-indigenous species can drastically influence and be detrimental to the native species of a wilderness area. This count gives an idea to the different types of non-indigenous species found in Kofa Wilderness.

Data Sources:
Susanna Henry, Refuge Manager
Kofa National Wildlife Refuge and Wilderness and NWM Wilderness Interagency Management Plan and Environmental Assessment

Process Used to Compile/Gather Data: Conversations with key refuge staff and looking over the lists in the Kofa National Wildlife Refuge and Wilderness and NWM Wilderness Interagency Management Plan and Environmental Assessment book.

Significant Change: Any. If there is an increase in the number of non-indigenous species in Kofa wilderness, it will reflect a degrading trend. Any non-indigenous species that are eradicated from Kofa Wilderness will reflect an improving trend.

Data Adequacy: Medium-High confidence in data. The final count was given by Refuge Manager. Spatial data of the range of impact these species have on wilderness would give a better picture as to what is going on in the wilderness than just a count. It is possible that if the data is collected, this measure could be updated in the future to show a better picture as to what is going how much non-indigenous species cover is in the wilderness.

Salt Cedar is a common non-indigenous species found in this region
Photo: FWS
**Character:** Natural  
**Indicator:** Plant and animal species and communities  
**Measure:** Present Bat Species

**Description:** Number of different bat species observed and documented during mist netting surveys in wilderness.

**Context:** Monitoring bat species is an important management activity on Kofa NWR. Creating a measure for present bat species will give an idea to the suitability of the habitat on Kofa that is conducive for bat populations.

**Data Sources:**  
*Annual Narrative Reports*  
Arizona Game and Fish Department  
Staff Biologists

**Process Used to Compile/Gather Data:** Conversations with key refuge staff, Arizona Game and Fish Department, and looking into the Annual Narrative Reports for legacy data and data that will determine the outcome of this year’s data count.

**Significant Change:** The significant change for this measure is “Any”. If there is an increase in documented present bat species, it will reflect an improving trend because there is greater biodiversity and habitat compatible for different species of bats in Kofa wilderness. A decrease in the present bat species documented will reflect a degrading trend. To find current year number: Take into account the current year plus previous 4 years of surveys to find present number of bat species.

**Data Adequacy:** High confidence in data. The mist netting surveys and the sampling size of 5 years will give a good indication as to how many species are found living and frequently using Kofa wilderness.

Leaf-nosed bat captured during survey  
Photo: Molly McCarter
**Character:** Natural  
**Indicator:** Biophysical Processes  
**Measure:** Natural Fires that Receive a Suppression Response Averaged Over the Wilderness

**Description:** Percent of natural fire starts suppressed in Kofa wilderness. Number of lightning-caused fires that were suppressed is divided by the total number of lightning-caused fires, multiplied by 100.

**Context:** Fires can drastically change the makeup of the wilderness. Also the actions to suppress these fires can impact the wilderness. This measure accounts for the fire as well as the actions related to suppression.

**Data Sources:**  
Susanna Henry, Refuge Manager  
Benji Stewart, Fire Operations Specialist

**Process Used to Compile/Gather Data:** Conversations with key refuge staff, Arizona Game and Fish Department, and looking into the Annual Narrative Reports for legacy data and data that will determine the outcome of this year’s data count.

**Significant Change:** The significant change for this measure is “Any”. Any increase to the amount of natural fires that are suppressed and actions of suppression would reflect a degrading trend. Any decrease in these actions would reflect an improving trend.

**Data Adequacy:** High confidence in data. Natural fires that receive a suppression response are well documented by Fire Management Team.
**Character:** Undeveloped  
**Indicator:** Non-recreational installations, structures and developments  
**Measure:** Actions to Cleanup Modern Human Debris - Abandoned Property, Mine, Military, etc.

**Description:** Numerical annual count of actions to cleanup modern human debris - abandoned property, mine and military debris.

**Context:** Cleanups of modern human debris in Kofa Wilderness repeatedly show up in Annual Narrative Reports. Wilderness legislation and the minimum requirement analysis are taken into consideration when the means of removal is selected for each project. For those reasons, this measure will only reflect a stable or improving trend. This could also entice refuge staff to take on more modern human debris cleanup projects if it will reflect an overall improving trend in wilderness character.

**Data Sources:**  
Susanna Henry, Refuge Manager  
Cixto Saucedo, Maintenance & Operations  
Kofa Files  
*Annual Narrative Reports*

**Process Used to Compile/Gather Data:** Conversations with staff and locating related files regarding cleanups, like Minimum Requirement Analysis documents.

**Significant Change:** The significant change for this measure is “Any”. For each action that removes debris from wilderness using the proper means, an improving trend is recorded. If one action for one year is followed by just one action the next year, this still shows an improving trend. Stable trend only appears when no actions are taken. This measure cannot reflect a degrading trend.

**Data Adequacy:** High confidence in data. Cleanup efforts in wilderness are well documented in the past and require a minimum requirement analysis of the plans on how to remove the debris.

Recent modern human debris cleanups on Kofa NWR  
Photos:FWS
**Character:** Undeveloped  
**Indicator:** Non-recreational installations, structures and developments  
**Measure:** Number of Active, Unpatented Mining Claims in Wilderness  

**Description:** Current and active mining claims found in wilderness from BLM files.

**Context:** Kofa has an extensive history in mining and this measure is to document the current amount of number of active, unpatented mining claims in wilderness and also monitor any future changes. These mining claims can impact the wilderness and its character in multiple ways. The ideal objective is to remove all mining claims and not allow any future mining be available in these wilderness areas.

**Data Sources:**  
Candy Holzer, Bureau of Land Management  
BLM.gov - LR2000  
Susanna Henry, Refuge Manager

**Process Used to Compile/Gather Data:** Went through paper mining files to locate the list of active, unpatented mining claims in Kofa. Called Bureau of Land Management because they handle to payments for these claims and asked for an updated record of present active claims. A tally of the total amount of active, unpatented mining claims that are found wilderness was found and used as the data for 2011.

**Significant Change:** The significant change for this measure would be “Any”. Any increase in the amount of active, unpatented mining claims in wilderness would result in a degrading change. If the number was to decrease, this would reflect an improving change. If no changes occur, the trend would be reflected as stable.

**Data Adequacy:** High confidence in data. Bureau of Land Management documents which claims are active for the current year. The township, range and section for each are also documented and it can be determined if it is in wilderness.
Character: Undeveloped  
Indicator: Non-recreational installations, structures and developments  
Measure: Developed/Enhanced Wildlife Water Source Structures  

Description: Number of man-made, developed wildlife water source structures and enhanced natural water source areas in wilderness. The count includes but is not limited to:
1a. Dams  
1b. Tanks  
1c. Wells  
1d. Catchments  
1e. Temporary water source structures  

Context: The main human development in Kofa Wilderness is the wildlife water sources that provide drinking water to species. Many of these sources are man-made or enhanced natural areas. Wildlife water sources were built on Kofa wilderness prior as well as after wilderness designation. The majority of these developments are found in wilderness. They are the subject for many current lawsuits related to wilderness protocol under the Wilderness Act of 1964. Having an inventory and monitoring these developments is the most important measure for the undeveloped character. There are currently 48 developed/enhanced wildlife water structures found in Kofa Wilderness.

Data Sources:  
Susanna Henry, Refuge Manager  
*Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment  
Kofa National Wildlife Refuge Water Attributes*  

Process Used to Compile/Gather Data: Cross referencing documents to find the most current list of developed/enhanced wildlife water source structures. Then double checking the accuracy of this list with the Refuge Manager, Susanna Henry.

Significant Change: The significant change for this measure is “Any”. If a current developed/enhanced wildlife water source is removed from wilderness, it will reflect an improving trend. If another development is added to wilderness, this will reflect a degrading trend. If nothing changes, it will reflect a stable trend.
Data Adequacy: High confidence in data. Many reliable sources were used to inventory how many of these developments are found in wilderness.
**Character:** Undeveloped  
**Indicator:** Non-recreational installations, structures and developments  
**Measure:** Other Authorized Non-Recreational Physical Development

**Description:** Number of structures that enhance wildlife water sources and other authorized non-recreational physical development found in wilderness. The count includes but is not limited to:
1a. Burro Fences (Count=1 per water source found)  
1b. Shade Structures (Count=1 per water source found)  
1c. Cement Steps (Count=1 per water source found)  
1d. Mine Safety Structures (Bat Gates)  
1e. Other Fences

**Context:** A category of other authorized non-recreational physical development is necessary for Kofa because there are many instances found in wilderness. Additional structures, primarily burro fences and shade structures have been installed throughout the years at some, but not all wildlife water sources in wilderness. Future developments may include mine safety structures to keep visitors safe as well as present bat habitats and other fences.

**Data Sources:**  
Susanna Henry, Refuge Manager  
*Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment*  
*Kofa National Wildlife Refuge Water Attributes Annual Narrative Reports*

**Process Used to Compile/Gather Data:**  
Cross referencing documents to find the most current list of developed/enhanced wildlife water source structures. Then double checking the accuracy of this list with the Refuge Manager, Susanna Henry.

**Significant Change:** The significant change is “Any”.

**Data Adequacy:** High confidence in data.
**Character:** Undeveloped  
**Indicator:** Use of motor vehicles, motorized equipment, and mechanical transport  
**Measure:** Type and Amount of Administrative, Non-Emergency, and Emergency Use of Motor Vehicles, Motorized Equipment, or Mechanical Transport

**Description:** Index of actual use of equipment or vehicle based on type of equipment (helicopter, chain saws, etc.) and weighted based on how many days used. Add up all the items used in wilderness plus the amount of days used to find the total to be imputed as data.

**Context:** Some management tasks as well as emergencies require the use of motor vehicles, motorized equipment, or mechanical transport. Though properly filling minimum requirement analysis will allow refuge staff to pick the least motor or mechanized way to complete a task, at times motor and mechanized practices are the most practical or financially feasible way to complete a project. This measure is to inventory and monitor all these insistences as well as emergencies in wilderness. Currently for 2011, the use has been limited to management using vehicles for wildlife water related tasks on administrative roads in wilderness.

**Data Sources:**  
Minimum Requirement Analysis documents  
Kofa Files  
Susanna Henry, Refuge Manager

**Process Used to Compile/Gather Data:** Reading documents as well as consulting with refuge staff.

**Significant Change:** The significant change for this measure is “Any”. Any increase the use of motorized or mechanized items would reflect a degrading trend. Any decrease in the use would reflect an improving trend.

**Data Adequacy:** Medium-high confidence in data. Projects are well documented in the Minimum Analysis Requirements but how the all projects are carried out cannot be closely monitored for every piece of equipment used in the wilderness.

View of wilderness boundary and “No Vehicle” sign with Castle Dome in the distance  
Photo: Kelly Lockman
Character: Undeveloped
Indicator: Use of motor vehicles, motorized equipment, and mechanical transport
Measure: Incidents and Known Civilian Vehicle Intrusions

Description: Number of incidents and known civilian vehicle intrusions in wilderness. This count includes:

1a. Violation notices issued for vehicle intrusions in wilderness
1b. Documented vehicle tracks in wilderness

Context: ATV/UTV use is a big recreational component in this area. There are designated roads throughout Kofa NWR but some visitors do not abide by the rules and enter wilderness on their vehicles. Tracks are noticeable and create considerable damage to wilderness character. Unfortunately it is difficult to catch every intrusion because of the size of Kofa, but some violation notices have been written in the past and refuge staff does notice the tracks when out on Kofa.

Data Sources:
Refuge Law Enforcement
Refuge Staff who does field work

Process Used to Compile/Gather Data: Collecting violation notices from refuge law enforcement and asking applicable refuge staff members if they have any documented instances of intrusions into wilderness.

Significant Change: The significant change for this measure is “Any”. Even though every instance of intrusion cannot be completely measured, the amount of violation notices and documented intrusions captured in a given year will be indicative of what is happening across Kofa wilderness. An increase in the amount of intrusions will reflect a degrading trend. A decrease in the amount of intrusions will reflect an improving trend. No change will reflect a stable trend.

Data Adequacy: Medium confidence in this data. Not all of the intrusions can be captured and there is a possibility that refuge staff members can choose not to document the incident because they do not want it to count against the refuge.
**Character:** Undeveloped  
**Indicator:** Inholdings  
**Measure:** Inholding Acres

**Description:** Acres of inholdings within and adjacent to wilderness and lie within refuge boundaries.

Includes any inholding that is within, surrounded, or at least one side touching wilderness and also falls within the refuge boundary line.

**Context:** Private land ownership in the form parcels within, adjacent or surrounded by wilderness all occur on Kofa. An inventory of the amount of acres of inholdings will monitor private land ownerships impact on wilderness character.

**Data Sources:**  
Kofa land/parcel files  
Susanna Henry, Refuge Manager

**Process Used to Compile/Gather Data:** Compiled documents from land files located in the file room and added up parcel acreage for each lot to find the total acres of inholdings. Double checked findings with Refuge Manager, Susanna Henry.

**Significant Change:** The significant change for this measure is “Any”. If the inholding acres decrease because the property was gifted/sold to Kofa NWR, this would reflect an improving trend. An increase in private inholdings within, surrounded, or adjacent to wilderness would reflect a degrading trend. No changes would reflect a stable trend.

**Data Adequacy:** High confidence in data. Recent inholding documents and data check by knowledgeable refuge staff.

*View of private inholding near King of Arizona Mine*  
*Photo: Kelly Lockman*
Character: Undeveloped
Indicator: Loss to statutorily protected cultural resources
Measure: Disturbances to Cultural Resources

Description: 1a. Severity of disturbances to cultural resources by photos/status reports
1b. Number/severity of disturbance to archeological sites or resources listed on National Register of Historic Places
1c. Disturbances/Removal of Big Eye Cabins

Context: According to the cultural resources book, Kofa has over 92 cultural resources and it is a big possibility that not all of them have been accounted for. There are many prehistoric and historic sites on Kofa. The sheer size and because not all of the sites have been found and current sites are not regularly monitored nor do they inventory disturbances, the only plausible measure to create for this indicator is to ask refuge staff to document disturbances when they come across them while working in the field.

Data Sources:
Cultural Resource Overview and Assessment of the Kofa NWR
Refuge Staff

Process Used to Compile/Gather Data:
The only known way to gather data is to ask refuge staff if they have noticed and/or documented any disturbances to cultural resources in wilderness.

Significant Change: The significant change for this measure is “Any”. If there are any increases in new disturbances, this will reflect a degrading trend. No new disturbances will create a stable trend. Though an improving trend does not appear to be plausible for this measure, if a new cultural resource is found, it should be noted and count positively for the refuge.

Data Adequacy: Medium confidence in data. Primitive cultural resources are not particularly monitored closely and not all of them have been found and mapped out in detail. This measure appeared to be the most suitable for Kofa because monitoring of cultural resources is not frequent.
Character: Solitude or Primitive and Unconfined Recreation
Indicator: Facilities that decrease self-reliant recreation
Measure: Agency Provided Foot Trails

Description: Miles to maintained foot trails provided for visitors in wilderness

Context: Compared to the size of Kofa NWR and wilderness, the amount of maintained foot trails is fairly insignificant. With that in mind, it is still important to monitor the amount of foot trails in wilderness so that they do not increase and degrade wilderness character and go against the Wilderness Act. There are only two foot trails in wilderness, one at Palm Canyon and another at Horse Tanks that total 0.65 miles. The trails are not highly developed but if a mesquite tree was to fall on the path, refuge staff would remove the tree to keep the path open to visitors.

Data Sources:
Susanna Henry, Refuge Manager

Process Used to Compile/Gather Data:
Speaking with knowledge refuge staff about foot trail locations and distances. Visiting foot trails in person to weigh their impact on wilderness character.

Significant Change: The significant change for this measure is “Any”. If there was an increase to the amount or distance in foot trails, this would reflect a degrading trend. If current foot trails were no longer maintained or designated as foot trails, this would reflect an improving trend.

Data Adequacy: High confidence in the data because speaking with knowledgeable staff and visiting the sites in person gave a higher confidence in the data given to me.
**Character:** Solitude or Primitive and Unconfined Recreation  
**Indicator:** Facilities that decrease self-reliant recreation  
**Measure:** Agency Provided Recreation Facilities

**Description:** This count includes but is not limited to:  
1a. Number of tent pads  
1b. Number of recreational/directional signs (NOT including refuge/wilderness boundary signs)  
1c. Number of shelters  
1d. Number of backcountry campsites

**Context:** Kofa refuge staff does not provide or maintain any recreation facilities that are not historic sites in wilderness. This measure is set up to fulfill this indicator and monitor future development of facilities that decrease self-reliant recreation in wilderness, if applicable.

**Data Sources:**  
Susanna Henry, Refuge Manager  
Documents Consulted

**Process Used to Compile/Gather Data:** Conversations with refuge staff and reading documents related to what is going on in the wilderness.

**Significant Change:** The significant change for this measure is “Any”. Any increase to the amount of facilities would reflect a degrading trend. The trend is now consistently stable because there are no facilities and the next possible trend would be degrading because they cannot improve on zero.

**Data Adequacy:** High confidence in data. The sources are very reliable. Only hesitation in the number is that Big Eye Mine Cabins were built during the mining period and not placed there by refuge staff for recreation. Visitors have the choice to use the structures if they would like to but it is not a requirement.
Character: Solitude or Primitive and Unconfined Recreation
Indicator: Management Restrictions
Measure: Camping Restrictions Around Wildlife Water Sources

Description: State law set distance that visitors must camp from wildlife water sources.

Context: It is state law that visitors are not allowed to camp within a ¼ mile of any wildlife water source. This was not put into action by management staff but it does affect wilderness character. Since there are many wildlife water sources in Kofa wilderness, this law does create many areas of wilderness as off limits to visitors. This measure could monitor an increase or decrease in the restrictions distance.

Data Sources: Kofa NWR brochure

Process Used to Compile/Gather Data: Reading many of the documents that are related to Kofa. In addition, consulting with refuge staff to make sure the data is correct.

Significant Change: The significant change for this measure is “Any”. Any increase to the distance would reflect a degrading trend. Any decrease in the distance would reflect an improving trend.

Data Adequacy: High confidence in data. If the distance increases in the future, possible a new measure could be created to take into account the total area of wilderness affected by this law and its influences on wilderness character.
**Character:** Solitude or Primitive and Unconfined Recreation  
**Indicator:** Remoteness from sights and sounds of people inside the wilderness  
**Measure:** Administrative Travel Routes and Access Roads

**Description:** Miles of administrative access routes and roads in wilderness. Routes and roads that are included in this measure are used to service water sources in wilderness areas.

**Context:** For management activities related to hauling water and maintenance, there are some areas in wilderness that have administrative access roads where motor transport is needed for tasks that are necessary to accommodate establishing refuge purposes.

**Data Sources:**  
Susanna Henry, Refuge Manager

**Process Used to Compile/Gather Data:**  
When having a conversation with the refuge manager I asked if data was available for this measure and she gave me the amount of administrative travel routes and access roads in miles.

**Significant Change:** The significant change for this measure is “Any”.

**Data Adequacy:** High confidence in data. Refuge Manager very knowledgeable of Kofa and this measure is easy to compile the data.
Character: Solitude  
Indicator: Remoteness from sights and sounds of people outside the wilderness  
Measure: Refuge Roads Adjacent to Wilderness

Description: Miles of designated refuge roads adjacent to wilderness

Context: Prior to wilderness designation, Kofa NWR had a series of refuge roads that went throughout the refuge for management activities as well as for visitor use. When Kofa designated most of its refuge as wilderness, most of the roads were still designated as refuge land. Though these roads are not in wilderness, they still impact the solitude character as they are visible from many parts of wilderness and vehicle traffic can be heard and seen from wilderness.

Data Sources:  
Kofa GIS data files

Process Used to Compile/Gather Data: Located GIS data files on refuge computer and enlisted the help of a refuge biologist to help with determining the miles or road.

Significant Change: The significant change for this measure is “Any”. If the amount of refuge roads were to increase this would reflect a degrading trend. If the amount of refuge roads were to decrease, it would reflect an improving trend.

Data Adequacy: High confidence in data. The data was gathered from an existing GIS refuge roads shapefile.
**Measures Not Used**

The measures listed in this section were not used for various reasons. Some measures no data is currently being collected and others may have been of low priority or have minimal impacts on Havasu Wilderness. At this time, this program was not intended to create additional work for refuge staff. Some of these measures listed below would need considerable amounts of time dedicated from refuge staff. Collecting data for some of these measures may also create more degradation to wilderness character than the measure the data is being collected for. Also, at the time this program was conducted at Kofa, there was no assigned biologist specifically to Kofa. There are GIS capabilities but no one there who worked on gathering and using data from the program. A biologist has since been hired, and in the future some of these measures may be selected to gather a better picture of Kofa’s wilderness character.

**Character:** Untrammeled  
**Indicator:** Actions authorized by refuge manager that manipulate the biophysical environment

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
</table>
| Actions to snare Mountain Lions                      | Hard to delineate between refuge and wilderness actions  
|                                                      | Partially captured in another used measure  
|                                                      | Low priority                                                                     |
| Actions to maintain water sources in wilderness       | Captured in an undeveloped used measure if applicable  
|                                                      | Low priority                                                                     |
| Actions to suppress non-native species                | Amount suppressed specifically to wilderness alone is not documented at this time  
|                                                      | Possible future measure  
|                                                      | Medium priority                                                                  |
| Number of hunting permits                             | Highly sensitive subject  
|                                                      | Low priority                                                                     |
| Number of scientific research projects                | Low priority                                                                  |
| Number of contamination investigations from prior activities | No data available  
|                                                      | Partially captured in used measure  
|                                                      | Low priority, does not happen regularly                                             |
| Actions to manipulate natural water flow              | No data available  
|                                                      | Partially captured in used measure  
|                                                      | Medium priority, possible future measure                                             |
**Character:** Untrammeled  
**Indicator:** Actions not authorized by refuge manager that manipulate the biophysical environment

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
</table>
| Magnitude and extent of mining activities inside wilderness | Captured in the amount of active, unpatented mining claims measure  
No data available  
Medium-Low priority |
| Number of incidents of abandoned property           | Captured in modern human debris cleanups  
Enormous wilderness to inventory all incidents  
Low priority |
| Number of illegal taking incidents of rocks and/or species | No data available, not accurately monitored  
Hard to distinguish between takings from wilderness and refuge  
Medium priority, possible future measure if it can be accurately documented |
| Other unauthorized actions                          | Main unauthorized actions captured that are the most accurately monitored  
None documented for 2011  
Medium-high priority, possible future measure |

**Character:** Natural  
**Indicator:** Plant and animal species and communities

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
</table>
| Number of native species of concern                | No specific list  
Other measures used had data available  
Medium priority |
| Acres of non-indigenous plant species              | Data for this measure is not collected at this time  
Possible future measure  
Medium priority |
| Change in demography or composition of communities | Data is not collected at this time and would create extra work for refuge staff  
Low priority, difficult to monitor |
| Abundance of Herptiles                             | Data not collected  
Possible future measure  
Medium-high Priority, illegally taken |
**Character:** Natural  
**Indicator:** Physical Resources

**Measures**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent and magnitude of change in water quality</td>
<td>Data not consistently gathered by refuge staff Medium priority, drinking water for species</td>
</tr>
<tr>
<td>Extent and magnitude of disturbance to desert pavement</td>
<td>Data not collected Low priority, disturbance conclusions can be drawn from vehicle intrusions</td>
</tr>
<tr>
<td>Extent and magnitude of soil contaminants from prior land use activities</td>
<td>Data not collected Low priority, too large of an area</td>
</tr>
<tr>
<td>Extent and magnitude of disturbance or loss of soil or soil crusts</td>
<td>Data not collected Low priority, Too large of an area</td>
</tr>
</tbody>
</table>

**Character:** Natural  
**Indicator:** Biophysical Processes

**Measures**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent and magnitude of global climate change</td>
<td>Data not collected by refuge staff Medium priority</td>
</tr>
<tr>
<td>Area and magnitude for pathways for movement of non-indigenous species into wilderness</td>
<td>Data not collected by refuge staff Low priority</td>
</tr>
<tr>
<td>Extent and magnitude of wildlife diseases</td>
<td>Data not regularly monitored by refuge staff Low priority at this time</td>
</tr>
</tbody>
</table>
### Character: Undeveloped

**Indicator:** Non-recreational structures, installations, and developments

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tracking devices</td>
<td>Low priority, data not collected or compiled Captured with management actions</td>
</tr>
<tr>
<td>Number of mines</td>
<td>Low priority Other mine related measures used</td>
</tr>
<tr>
<td>Linear miles of utilities</td>
<td>Low priority Low occurrences on wilderness Possible future measure if changes occur</td>
</tr>
</tbody>
</table>

### Character: Undeveloped

**Indicator:** Use of motor vehicles, motorized equipment, and mechanical transport

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of uses of aircrafts for wildlife management</td>
<td>Low priority If landing occurs, this will be captured under another used measure</td>
</tr>
<tr>
<td>Number of military flyovers</td>
<td>No data collected Low priority, difficult to manage</td>
</tr>
</tbody>
</table>

### Character: Undeveloped

**Indicator:** Inholdings

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area and existing or potential impact of inholdings within and adjacent to wilderness</td>
<td>Impact data not collected Other measure used Medium priority, possible future future measure</td>
</tr>
</tbody>
</table>

### Character: Undeveloped

**Indicator:** Loss to statutorily protected cultural resources

**Measures:** n/a
**Character:** Solitude  
**Indicator:** Remoteness from sights and sounds of people inside the wilderness

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
</table>
| Amount of visitor use                        | Not monitored  
Possible future measure if means of monitoring visitor use becomes more accurate  
Medium priority |
| Number of trail contacts                     | Large wilderness area to cover  
Depends greatly on time of year  
Summer not heavily used  
Low priority |
| Number and conditions of campsites           | Not applicable or monitored  
No designated campsites  
Could be captured in other measure used  
Low priority |
| Area of wilderness affected by access and travel routes that are inside the wilderness | Captured by another measure  
Possible future measure if appropriately analyzed by staff |
| Number of tracking devices on animals        | Accurate number not available  
Partially captured in other measure used  
Low priority |
**Character:** Solitude  
**Indicator:** Remoteness from occupied and modified areas outside the wilderness

<table>
<thead>
<tr>
<th>Measures</th>
<th>Reason/Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of wilderness affected by access and travel routes that are outside the wilderness</td>
<td>Partially captured in another measure used Possible future measure if appropriately analyzed by staff Medium priority</td>
</tr>
<tr>
<td>Sights and sounds from inholdings</td>
<td>Not monitored Unsure how to monitor Low priority</td>
</tr>
<tr>
<td>Visibility of development from wilderness</td>
<td>Partially capture in other used measures Medium priority, not monitored</td>
</tr>
<tr>
<td>Night sky visibility averaged over wilderness</td>
<td>No established protocol Possible future measure Medium priority, not monitored</td>
</tr>
<tr>
<td>Extent and magnitude of intrusions on the natural soundscape</td>
<td>Usage periods vary greatly during different times of the year Refuge staff cannot control adjacent military activities Low priority, not monitored</td>
</tr>
<tr>
<td>Visibility of refuge activities from wilderness</td>
<td>Unable to accurately monitor Low priority</td>
</tr>
<tr>
<td>Sights and sounds of military activities from wilderness</td>
<td>Unable to accurately monitor Refuge staff cannot control military activities Low priority</td>
</tr>
</tbody>
</table>

**Character:** Solitude  
**Indicator:** Facilities that decrease self-reliant recreation

**Measures:** n/a

**Character:** Solitude  
**Indicator:** Management Restrictions

**Measures:** n/a
Conclusions

The selected measures give a comprehensive approach to the many actions that happen within and affect wilderness. Keeping the number of measures under 25, staff will be able to document the data for each measure more accurately than if there was a measure for every action related to wilderness character. This is not to imply that every measure data will be one hundred percent accurate and not every trend outcome is completely controllable by refuge staff.

The sheer size of the wilderness in Kofa NWR creates a difficulty in appropriately monitoring selected measures and was the primary reason why many of the measures were eliminated from monitoring. For example, in such a large area it is difficult to capture all of the civilian vehicle intrusions in wilderness and those actions have a huge impact on wilderness character. A change in the trend for this measure could be due to simply finding more tracks in subsequent years, and it is not a clear indication as to which year more tracks were created. Therefore, the accuracy of a changing trend for this measure is questionable. Kofa’s size also contributed to eliminating measures that monitored illegal poaching and rock takings as well as abundance of herpitiles. While both are important in assessing wilderness character, the wilderness area is too large and the size of the staff cannot accommodate these additional tasks.

Out of all the characters for wilderness monitoring, Kofa Wilderness is currently most affected in the Undeveloped character. The level of monitoring varies between the four indicators for this quality. The measures used under the indicators of non-recreational installations, structures and developments and inholdings are evident throughout the wilderness and are now well documented in a central location. Use of motorized and mechanized equipment and loss to statutorily protected cultural resources are monitored in less detail than the other indicators. Staff has been instructed to recognize actions and keep better documentation on measures under these indicators.

Kofa Wilderness overall provides outstanding opportunities for solitude or primitive and unconfined recreation within the wilderness compared to the impacts of actions that fall under other characters. As of 2011, Kofa does not provide any recreational specific facilities in wilderness and less than a mile of agency provided foot trails. Management restrictions are minimal; the most confined rule is a camping restriction that is a state law. The largest intrusions on solitude are refuge and Yuma Proving Grounds activities which are adjacent to wilderness.

Many of the measures selected should reflect a stable trend from year to year unless a very significant event takes place in wilderness. Significant events include the increase or decrease in roads, facilities, wildlife water sources, other structures and installations, an acquisition of an inholding, or an extirpation of a species. This should allow the staff to focus on the measures that require more work and documentation because significant events in wilderness like the ones mentioned above rarely go unnoticed by staff and interested parties.
## Appendix

### Keeping Track of Wilderness Character Monitoring Measures – Kofa NWR Wilderness

<table>
<thead>
<tr>
<th>Measure</th>
<th>Priority (H, M, L)</th>
<th>Detailed Description of the Data Source(s) and How the Data Were Gathered</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Untrammeled Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Actions to Manage Wildlife</td>
<td>H</td>
<td>Refuge manager and staff biologist for recent data. Also recent annual narrative reports for legacy data.</td>
</tr>
<tr>
<td>2. Amount of Water Supplemented to Wildlife Water Sources</td>
<td>H</td>
<td>Refuge manager and maintenance department. Also recent annual narrative reports for legacy data.</td>
</tr>
<tr>
<td>3. Human Ignited Fires</td>
<td>M</td>
<td>Fire department and law enforcement</td>
</tr>
<tr>
<td>4. Military and Border Patrol Intrusions</td>
<td>L</td>
<td>Refuge manager and law enforcement</td>
</tr>
<tr>
<td><strong>Natural Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Desert Bighorn Sheep</td>
<td>H</td>
<td>Kofa Group Size Estimator totals from annual narrative reports. Recent data from refuge manager.</td>
</tr>
<tr>
<td>6. Extirpated Plants and Animals</td>
<td>M</td>
<td>Refuge Manager and Arizona Game and Fish Department</td>
</tr>
<tr>
<td>7. Non-Indigenous Species</td>
<td>M</td>
<td>Refuge Manager and Arizona Game and Fish Department</td>
</tr>
<tr>
<td>8. Present Bat Species</td>
<td>M</td>
<td>refuge manager and Arizona Game and Fish Department</td>
</tr>
<tr>
<td>9. Natural Fires that Receive Suppression Response Averaged Over the Wilderness</td>
<td>L</td>
<td>Fire Department</td>
</tr>
<tr>
<td><strong>Undeveloped Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Actions to Cleanup Modern Human Debris - Abandoned Property, Mine, Military, etc.</td>
<td>H</td>
<td>Refuge Manager Minimum Requirement Analysis Reports Annual Narrative Reports</td>
</tr>
<tr>
<td>11. Number of Active, Unpatented Mining Claims in Wilderness</td>
<td>H</td>
<td>Refuge Manager for initial direction to possible locations Bureau of Land Management, Candy Holzer Blm.gov site for LR2000 Land and Minerals Records Database</td>
</tr>
<tr>
<td>12. Developed/Enhanced Wildlife Water Source Structures</td>
<td>H</td>
<td>Combining the following three resources to compile a list of developed/enhanced water source structures specifically in wilderness: Susanna Henry, Refuge Manager.</td>
</tr>
</tbody>
</table>

Kofa NWR Wilderness Character Monitoring
| Environmental Assessment  
Kofa National Wildlife Refuge Water Attributes |
|---------------------------------------------|
| **13. Other Authorized Non-Recreational Physical Development** | H | Combining the following three resources to compile a list:  
Susanna Henry, Refuge Manager  
*Kofa National Wildlife Refuge and Wilderness and New Water Mountains Wilderness Interagency Management Plan and Environmental Assessment  
Kofa National Wildlife Refuge Water Attributes* |
| **14. Type and Amount of Administrative, Non-Emergency, and Emergency Use of Motor Vehicles, Motorized Equipment, or Mechanical Transport** | M | Refuge Manager  
Law Enforcement |
| **15. Incidents and Known Civilian Vehicle Intrusions** | H | Law Enforcement. Data compiled in Uniform Crime Reports. |
| **16. Inholding Acres** | M | Kofa Planning Files |
| **17. Disturbances to Cultural Resources** | L | Law Enforcement |

**Solitude or Primitive and Unconfined Recreation**

| **18. Agency Provided Foot Trails** | L | Refuge Manager |
| **19. Agency Provided Recreation Facilities** | L | Refuge Manager |
| **20. Camping Restrictions Around Wildlife Water Sources** | L | Kofa NWR Brochure |
| **21. Administrative Travel Routes and Access Roads** | M | Refuge Manager |
| **22. Refuge Roads Adjacent to Wilderness** | M | GIS Files |
**Worksheet: Prioritizing Measures of Wilderness Character**

In each row, write the indicator and potential measure in the left column. Use the following criteria and ranking guide to create an overall score for each measure. Those measures with the highest overall scores should be the highest priority for assessing trends in wilderness character.

A. Level of importance (the measure is highly relevant to the quality and indicator of wilderness character, and is highly useful for managing the wilderness): **High = 3 points, Medium = 2 points, Low = 1 point**

B. Level of vulnerability (measures an attribute of wilderness character that currently is at risk, or might likely be at risk over 10-15 years): **High = 3 points, Medium = 2 points, Low = 1 point**

C. Degree of reliability (the measure can be monitored accurately with a high degree of confidence, and would yield the same result if measured by different people at different times): **High = 3 points, Medium = 2 points, Low = 1 point**

D. Degree of reasonableness (the measure is related to an existing effort or could be monitored without significant additional effort): **High = 1 point, Low = 0 point**

---

**Quality of Wilderness Character: Untrammeled**

<table>
<thead>
<tr>
<th>Potential Measure</th>
<th>A. Importance</th>
<th>B. Vulnerability</th>
<th>C. Reliability</th>
<th>D. Reasonableness</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator: actions authorized by manager to manipulate environment</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Measure: Actions to Manage Wildlife</td>
<td>STOP! If A + B ≤ 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator: actions authorized by manager to manipulate environment</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Measure: Amount of Water Supplemented to Wildlife Water Sources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Criteria for Prioritizing Potential Measures

<table>
<thead>
<tr>
<th>Potential Measure</th>
<th>A. Importance</th>
<th>B. Vulnerability</th>
<th>C. Reliability</th>
<th>D. Reasonableness</th>
<th>OVERALL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator: actions not authorized by manager to manipulate environment</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
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<td>Measure: Human Ignited Fires</td>
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<tr>
<td>Indicator: actions NOT authorized by manager to manipulate environment</td>
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<tr>
<td>Measure: Military and Border Patrol Intrusions</td>
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Quality of Wilderness Character __________ Natural __________

Criteria for Prioritizing Potential Measures

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<tr>
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<tr>
<td>Indicator: Plant and animal species communities</td>
<td>2</td>
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<tr>
<td>Measure: Number of non-indigenous species</td>
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STOP! If A + B ≤ 2
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<td>Measure: Number of extirpated indigenous species</td>
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<td>Measure: Desert Bighorn Sheep</td>
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<td>Measure: Present Bat Species</td>
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<td>Indicator: Biophysical Processes</td>
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<td>Measure: Natural Fires that Receive a Suppression Response Averaged Over the Wilderness</td>
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<tr>
<td>Indicator: Non-recreational structures, installations, and developments</td>
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<tr>
<td>Measure: Actions to Cleanup Modern Human Debris - Abandoned Property, Mine, Military, etc</td>
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<td>Measure: Acres of Active, Unpatented Mining Claims in Wilderness</td>
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<tr>
<td>Measure: Developed/Enhanced Wildlife Water Source Structures</td>
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**STOP!** If A + B ≤ 2
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<td>Measure: Other Authorized Non-Recreational Physical Development</td>
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<td>Indicator: Motor Vehicles, Motorized Equipment, or Mechanical Transport</td>
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<td>Measure: Type and Amount of Administrative, Non-Emergency, and Emergency Use of Motor Vehicles, Motorized Equipment, or Mechanical Transport</td>
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<td>Potential Measure</td>
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<td>Indicator: Inholdings</td>
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<td>Measure: Inholding Acres</td>
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<td>Indicator: Loss to statutorily protected cultural resources</td>
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<td>Measure: Disturbances to Cultural Resources</td>
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<td>Indicator: Remoteness from sights and sounds of people inside the wilderness</td>
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<td>Measure: Number of Special Use Permits</td>
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<td>Measure: Administrative Travel Routes /Access Roads</td>
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**STOP!** If \( A + B \leq 2 \)

**QUALITY OF WILDERNESS CHARACTER __________ SOLITUDE __________**
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<td>Indicator: Remoteness from occupied and modified areas outside the wilderness</td>
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<td>Measure: Refuge Roads Adjacent to Wilderness</td>
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<td>Indicator: Facilities that decrease self-reliant recreation</td>
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<td>Measure: Agency Provided Foot Trails</td>
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<td>Indicator: Management Restrictions on visitor behavior</td>
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<td>Measure: Camping Restrictions Around Water Sources</td>
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