What is SMART?

The Spatial Monitoring and Reporting Tool (SMART) is designed to improve anti-poaching efforts and overall law enforcement and management effectiveness in established marine and terrestrial conservation areas and management zones. SMART enables the collection, storage, communication, and evaluation of data on: patrol efforts (e.g., time spent on patrols, areas visited, distances covered), patrol results (e.g., arrests made), threat levels, and other enforcement activities. The “SMART Approach” combines the cutting edge site based management tool with capacity building and a set of protection standards. When effectively employed to create and sustain information flow between patrol teams, analysts, and conservation managers, the SMART Approach can help to substantially improve protection of marine wildlife and their habitats.
This guide is written for site managers (e.g., marine protected area managers, community managers) and conservation (NGO) partners who are considering introducing SMART in a conservation area. Successful implementation of SMART requires a major commitment by the implementing agency and technical support agencies, and careful considerations should be made before initiating this approach. This guide provides an overview of what is required to make SMART a success and describes the main steps in the preparation and introduction of the SMART Approach in a conservation area. It is built on the collective experience of SMART implementers and site-based protection staff. What follows is not a detailed training manual, as training resources are available on the SMART website (smartconservationtools.org). Rather, you will find a checklist that will help:

a) determine whether your site is suitable for SMART (not all sites are, and it is better to recognize that up front);
b) identify key capacity, financial, and management needs for SMART implementation;
c) help plan a realistic program for SMART implementation at your site that will best ensure long term success.

The SMART Approach can be introduced to any conservation area that relies on field patrol teams to protect wildlife and the natural ecosystems upon which they depend. This approach has already demonstrated its effectiveness in improving law enforcement efforts, improving morale of enforcement teams, and reducing threats to wildlife and other natural resources across various sites throughout the world. At present, SMART is being implemented in more than 500 conservation areas in 47 countries worldwide, and has rapidly become the global standard for wildlife law enforcement monitoring and management in protected areas (marine and terrestrial), community-managed zones, and conservancies. For an up-to-date list of the steadily growing number of conservation areas where SMART has been introduced, visit: smartconservationtools.org.

Using the SMART software and establishing a patrol database will not, on its own, improve protection in a conservation area. In addition to the SMART software and database, basic enforcement capacity and infrastructure must be in place. Adaptive patrol management practices must be introduced that require, among other things: additional resources; staff with management, analytic, and computer skills; processing and evaluation of patrol data; feedback mechanisms between managers and rangers; and appropriate ranger performance-based incentives. This combination of monitoring law enforcement effort, results, and threats to inform and adapt management practices is what we call the SMART Approach.
The SMART Partnership was established in 2011 with the purpose of developing SMART protection monitoring software and supporting tools for improving protection management. The current SMART Partnership members are: Frankfurt Zoological Society, Global Wildlife Conservation, North Carolina Zoological Park, Panthera, Peace Parks Foundation, Wildlife Conservation Society (WCS), Wildlife Protection Solutions (WPS), World Wildlife Fund (WWF), and Zoological Society of London (ZSL). For more information on how the Partnership works visit:

smartconservationtools.org/partnership.
Before you start:

In any given marine conservation area, SMART does not require successful pre-existing management practices, but it is important that the basic building blocks for adaptive management are in place [see the ‘SMART Approach’ section for a definition of adaptive patrol management]. Without this basic framework, SMART is unlikely to succeed in improving management effectiveness, and may result in wasted or diverted conservation resources. The following basic requirements will help you decide if your conservation area is ready to begin introducing SMART:

A formal management structure must be in place in the conservation area where an adaptive management approach can operate. Without an accepted management authority to evaluate patrol results and lead decision-making, it will be difficult to effect measurable change in patrol practices. Such a management authority might include a marine protected area agency, a fisheries management department, or a community-based management authority. In all cases, the relevant authority (Director, Deputy Director) needs to have decision-making responsibilities.

Endorsement for the SMART Approach from the relevant management authority. The level at which this endorsement is required will depend upon the particular governance structure. For highly centralized governance structures, endorsement may be required at national level; for decentralized governance structures, endorsement may be required only at the level of an individual protected area manager.

Some level of active field patrolling at the site indicating there is a commitment to put resources into protection and monitoring activities, and the collection of field observational data demonstrating patrol efforts and results from patrolling. While many conservation areas may not have sufficient resources or staff to patrol the entire conservation area continuously, some basic level of patrolling is required at the outset. This will generate sufficient and meaningful data with which to inform management decisions and identify resource gaps once the SMART Approach is fully implemented.

Skills required from management include:

1) effective leadership;
2) an understanding of patrol issues (including the main threats and how patrols can address them); and,
3) analytical skills for evaluating patrol data and providing feedback to patrol teams. Staff with a strong technological proficiency are required for database design, patrol data storage, and data management. IT experts should be available on standby, either at the conservation area or remotely, to solve technical problems when they occur.

Commitment to improving management systems. Adaptive patrol management with SMART implies a commitment to improve a site’s management practices. This level of commitment must come at minimum from the responsible management authority. Managers should be willing to consider a change in protection strategies, management practices, or budget allocations in order to improve enforcement. Managers must also be willing to enact these changes by demonstrating strong leadership in mobilizing an effective and motivated ranger force.

Financial planning to ensure adequate resources are in place to operate patrols, including patrol mission costs and ranger salaries. Adequate resources must also be allocated to secure the necessary field equipment for collecting and managing patrol data (e.g., computers, GPS units, batteries, battery chargers, power source). SMART is a spatial monitoring tool and requires at minimum a GPS or spatial data logging device.
Ensuring SMART Quality

Experienced site protection managers may be able to introduce SMART without prior experience and external technical assistance. However, it is strongly recommended that site-based staff attend training workshops approved by SMART Partners on the use of SMART software and application of the SMART Approach for adaptive management. It is also highly recommended to involve experienced SMART experts from conservation agencies or conservation NGOs in the introduction of the SMART Approach at your site (e.g., invite them to assist in adaptive management design and ranger trainings or organize study tours to well-established SMART sites). It is also recommended to take advantage of the SMART Forum established for users to post problems and share experiences and expertise.
Conduct a threats analysis and define conservation objectives and indicators – A threats analysis should be conducted for target species and their habitat to identify actions that rangers can initiate to address these threats. This may include gathering all available information on the status of the conservation area, including distribution of marine life and habitats, access points and fishing zones, and existing protection infrastructure. Objectives for patrol efforts and interventions, including threat-reduction and recovering/maintaining habitat and target species populations, should be formulated with as much detail as possible. This process will also define key indicators against which progress will be measured and evaluated, and should be conducted at the site level and involve managers, patrol staff, and/or biologists who are knowledgeable about the conservation area.

Preparing for SMART implementation

Once you are ready to begin implementation a number of preparatory steps for SMART introduction need to be completed at the site level. The following checklist will help you to adequately plan for SMART implementation:

- **Conduct a threats analysis and define conservation objectives and indicators** – A threats analysis should be conducted for target species and their habitat to identify actions that rangers can initiate to address these threats. This may include gathering all available information on the status of the conservation area, including distribution of marine life and habitats, access points and fishing zones, and existing protection infrastructure. Objectives for patrol efforts and interventions, including threat-reduction and recovering/maintaining habitat and target species populations, should be formulated with as much detail as possible. This process will also define key indicators against which progress will be measured and evaluated, and should be conducted at the site level and involve managers, patrol staff, and/or biologists who are knowledgeable about the conservation area.

- **Define reporting needs** – Regular and standardized patrol reports should be developed that summarize key data and performance indicators in the form of clear, user-friendly tables and maps. A timetable for report production (e.g., weekly, monthly, quarterly, annually), content of the report, and a distribution list should be defined. These reports will form the basis for evaluating patrol efforts and results against patrolling and conservation objectives.

- **Identify any additional intelligence gathering mechanisms** that can be used to inform patrol planning and evaluation. SMART supports an intelligence-led patrolling approach. Intelligence is actionable information originating either from patrols themselves or from third-party sources that can help inform patrol deployment.
Design the data model and collection protocols – The SMART data model will define what information patrols should be collecting (and entered into the SMART database), and will form the basis for all analysis and reporting. Therefore, it is critical to think carefully about this at the outset—typically during a workshop led by the site manager and with senior protection staff present. Data can be collected during patrols on a wide range of topics, but it is recommended to focus on key threats and observations that can be unambiguously identified by patrols in the field (e.g., illegal fishing activity, unauthorized area access), actions that address threats (e.g., fishing gear removed or confiscated, warnings issued), and observations of key marine species. In our experience, data models typically start out too complex and need to be streamlined through trial and error in the field. It is important to keep the data model simple and collect only data that are useful for patrol management as defined by the SMART indicators above. Data collection should not take so much time that rangers cannot remain focused on their main task: patrolling. The SMART data collection protocols will define how information is recorded by rangers in the field. The protocols should be sufficiently detailed as to ensure standardization, avoid ambiguity in the field, and minimize any compromise in data quality. The data collection protocols should be clearly defined in a ranger data collection manual. Data collection can be done on paper forms with a GPS or through handheld GPS-enabled mobile devices. Paper and digital forms need to be customized according to the data model designed for your site. A default data model has been developed which is available for users and can be altered to meet your site needs.

Identify appropriate mechanisms for adaptive management and regular feedback – Patrol reports should be discussed with all patrol staff (or patrol team leaders) during regular feedback meetings led by the site manager. Team leaders should be invited to comment on their patrol performance and patrol targets for the next period should be developed with the aim of improving performance.

Preparing a training plan - Training must be conducted for:

- a) patrol staff in data collection protocols, including exercises for data collection, navigation with GPS units, and documenting patrol routes.
- b) SMART operators in setting up, operating, and managing the SMART database.
- c) analysts in interpreting results of patrol data in order to evaluate performance and in conducting trends analysis.
- d) managers who are learning how to make the most of SMART information to improve conservation and management efforts.

Consider a performance-based ranger evaluation system – SMART patrol monitoring enables accurate measures of effort and results of patrol teams and individual rangers. In some situations, it can be recommended to link ranger salaries, bonuses, evaluations, awards, and promotions to patrol performance as measured — and verified by — SMART. Changes in reward and evaluation systems should be designed and discussed with the rangers before the SMART Approach is launched. If a performance-based ranger incentive scheme is implemented, resources also need to be allocated to sustain the scheme.

Configuring the SMART database – SMART software must be installed on a permanent computer at the site and a SMART database configured for the conservation area. The configured database includes the designed data model, GIS layers that determine the spatial boundaries of the conservation area (e.g., conservation area limits, patrolling sectors, administrative zones), key patrol parameters (e.g., patrol stations, staff, mandates, transport options), and standard queries and reports that produce desired performance indicators. Database administration and data management protocols should also be put in place to ensure data security and regular backup.
Defining responsibilities – The responsibilities of all staff involved in the application of the SMART Approach for patrol management should be defined, including who will: be responsible for data collection during patrols, check patrol data handed in by patrols (patrol debriefing), store information in a database, process data, conduct analysis, and prepare patrol reports, evaluate the patrol performance on the basis of these reports, and prepare and conduct feedback meetings with rangers. (These last points are typically, but not always, performed by the site manager). A SMART point person should be identified whose role is to oversee and ensure correct functioning of all these steps.

Monitoring program – A monitoring program should be in place to evaluate performance against conservation objectives, such as decreasing threats, increasing or maintaining populations of target conservation species or improving habitat quality. The main conservation target species populations should be monitored using standardized and scientifically rigorous methods. While rangers can be involved in such a scientific monitoring program, monitoring during patrols should focus on no more than a few target species and not detract from the primary responsibility of rangers, which is law enforcement.

Developing a clear timetable for implementation – The data model and protocols for data collection, storage, management, and processing should be tested and evaluated during an initial period of at least four weeks. During this time it will become clear whether rangers understand the data collection procedures and can consistently conduct data collection. Any problems related to data collection protocols and the use of software for data storage and processing should be resolved during the test period. Following the first year of SMART implementation, a full evaluation should be conducted to assess progress in implementation of the SMART Approach.
RANGER PATROLS Patrol teams collect and record data on where they go and what they see while on patrol, such as threats (e.g., illegal fishing), patrol results (e.g., arrests, confiscations of fishing gear), and observations of marine life.

DATA INPUT Patrols report their patrol activities, and patrol data and routes are checked and then stored in a SMART patrol database.

ANALYSIS AND REPORTING Data are processed into highly visual tables, charts, and maps showing patrol effort, coverage, and results, forming the basis for patrol analysis and evaluation.

FEEDBACK AND EVALUATION Regular meetings with rangers are held to discuss patrol effort and results to ensure all stakeholders are kept informed and to demonstrate the value of ranger efforts.

STRATEGIC PLANNING Managers, rangers, and other stakeholders plan adaptive patrol strategies based on analysis of previous results and set new patrol targets.
Evaluating the SMART Approach

When SMART patrol monitoring and the adaptive patrol management cycle are operating, regular patrol reports (usually monthly or quarterly) should be produced to evaluate patrol performance and provide feedback to rangers. Less frequent (e.g. annually) and more in-depth data analyses, with an evaluation of various trends in patrol performance and threat-levels, as well as an evaluation of the entire patrol management system, are required. Useful questions to ask during these in-depth analyses and evaluations include:

- Are any changes required in the SMART patrol monitoring and adaptive management practices? Related questions include:
  - Are all patrol data used for patrol management, or is it possible to review and streamline the data model?
  - Should patrol team composition, leadership, patrol priorities, position of patrol stations, or patrol methods be changed?
  - Are the patrol data collection, storage, processing, evaluation, reporting, and ranger feedback procedures satisfactory? Should the content or frequency of patrol reports and feedback meetings be changed?
  - Are changes in the ranger salaries, bonuses, or evaluation procedures required to increase ranger morale and patrol performance?
  - Is the manager responsive to information on threats coming from field patrol teams and is the manager correctly interpreting risk factors based on this information?

- Is the law enforcement presence being maintained at the site, and are patrols occurring throughout the reporting period, or at least on a systematic or regular basis? Is the manager responsive to information coming from patrol teams and are directives from management based at least partly on this information?

- Are patrol targets and the conservation objectives being met? What are the trends in threat levels?

- Which kind of patrols are most effective in reducing threats and meeting targets? Compare the effectiveness of different patrol mandates, transport types, and whether patrols were intelligence-led, in order to determine their impact on detecting illegal activities and patrol results (e.g., arrests).

- Is intelligence effective and leading to improved enforcement outcomes?

- Are patrols sufficiently focusing on areas with the highest threat-levels and/or highest densities of conservation target species? Are patrol routes predictable?
SMART Marine

SMART can be readily and flexibly applied to marine conservation and marine protected area (MPA) management. For marine sites, SMART enables the collection, storage, communication, and evaluation of data on marine patrol efforts and results, as well as threat levels. SMART can also collect data on monitoring of marine species and fisheries, such as local and commercial landing data in ports. When effectively employed in marine conservation areas, SMART helps improve management and deployment of patrols and resources, as well as the protection of marine wildlife and their habitats.

Key Benefits:

- Empower rangers and community patrols by:
  - Motivating them in their day-to-day work by optimizing the data collection process;
  - Using patrol data to provide patrol teams with regular feedback and review, and to improve patrol management;
  - Ensuring accountability and good governance through clear and standardized performance indicators.

- Prioritize resources and plan patrols:
  - SMART is user-friendly to help managers strategically plan and deploy their patrol operations.

- Demonstrate the impact of patrolling through:
  - Rapid, accurate, and impactful interpretations and reporting of patrol data and enforcement activities
  - Tracking legal and administrative cases resulting from patrols and enforcement actions

Things to consider before SMART marine implementation:

- Many considerations for marine applications are similar to the general considerations detailed in the “Before You Start” and “Preparing for SMART Implementation” sections above, but additional marine-specific considerations are included below.

- Are there sufficient financial and technical resources at your site to implement marine patrols?

Case Study: Koh Rong Archipelago, Cambodia

SMART community patrols in Cambodia’s first Marine Protected Area.

- SMART marine patrols allowed for identification of illegal activity hotspots, but were restricted to their detection of activities in patrolled areas. Gaps highlighted by SMART patrol data were cross-referenced with data interviews with local communities, allowing for improved patrol planning.

- When compared to interview data, SMART patrol data indicated that patrols were not occurring at night, the peak time for illegal activities.

Minimum Software/Hardware Requirements

SMART Marine utilizes the base SMART Installation. You will need a computer (laptop or desktop) with Windows OS (min 4GB RAM; 8 or higher recommended), with the basic SMART software program is installed and configured for your site(s).
SMART marine considerations (continued):

- Do you have safe boat for patrolling?
- Who are you sending out on patrols, and what additional training and/or equipment might they need in order to ensure their safety, e.g., life jackets, flares, lights etc.?
- How will communication with headquarters be maintained (e.g., cell phone or other communication devices such as VHF radio or walkie-talkie for areas outside of cell phone network)?
- What are your patrol objectives (e.g., enforcement targets, target species, etc.)?
- How should you structure your configurable data model to ensure data can be easily and unambiguously collected by rangers, while still effectively meeting your patrol objectives?
- What size is your site: can SMART be used in conjunction with other tools in order to make patrols more effective and to increase detection?
- Equipment availability, Do you have the necessary computers, handheld devices, software and applications? Plan for additional equipment
- Do you plan to implement mobile handheld units for data collection? Is there sufficient ranger capacity to collect data on a mobile handheld device? If not, have you developed a training plan?
- Have you developed hardware maintenance (e.g., routine care) and security protocols (e.g., lost/misplaced devices) to ensure accountability and lengthen the life of the devices?
- Is there wifi/cellular coverage at your site that could facilitate use of SMART Connect? If so, have you considered the benefits of Connect use at your site?
- Consider what data can be used for prosecution: check local laws and what information is needed in order to build a case and ensure this is captured within your data model, e.g., vessel number, captain’s name and registration, photos, etc. Use this information from outset.
- If doing joint patrols, who has authority to collect data and what data can you document?
- Who processes data and reports: ensure there is a good feedback loop between data analysis and reporting and those on the ground otherwise this risks undermining efforts.

Case Study: Sundarbans Mangrove Forest, Bangladesh
SMART patrols improve management and enforcement effectiveness.

- SMART helped the Bangladesh Forest Department to organize patrols, set standards for patrol performance, and demonstrate efforts made by frontline staff to patrol and monitor illegal entry, poaching, illegal fishing, harvesting of non-timber forest products, and other illegal activities in the Sundarbans.
- Based on initial successes, the Bangladeshi Government officially adopted SMART for deployment of all patrols as of September 2017.

Case Study: Gökova Bay Marine Protected Area, Turkey
SMART patrolling and fishery monitoring in the Mediterranean.

- The Mediterranean Conservation society implemented SMART for all patrol and enforcement activities, enhancing patrol management and effectiveness, strengthening evidence gathering for legal actions against infractions, and economizing overall fuel costs.
- SMART was adapted to collect landing data to monitor critical fisheries in real time, significantly improving the speed and efficiency of data entry, analysis, and reporting.
SMART Functionality

**LAW ENFORCEMENT MONITORING** The world’s leading solution for law enforcement monitoring and marine protected area management.

**MOBILE DATA COLLECTION-CYBERTRACKER** The best solution for capturing data and monitoring conservation activities in marine protected areas.

**ECOLOGICAL RECORDS** A powerful and flexible tool for the capture, management, mapping and analysis of ecological data for conservation in marine protected areas.

**PLANNING** An adaptive, easy to use solution for managers to enhance decision-making and help optimize deployment of limited conservation resources.

**CONNECT** A Cloud-based extension to the SMART suite of tools for enhancing marine protected area management.

**INTELLIGENCE** The only protected area-focused entity management solution.
SMART Law Enforcement Monitoring

SMART is the world’s leading tool for conservation law enforcement monitoring (LEM) and protected area management. SMART LEM enables the collection, storage, communication, and evaluation of data on patrol efforts, patrol results, and threat levels. Implementation of SMART LEM has enhanced law enforcement effectiveness, improved morale of protection teams, and reduced threats to wildlife and other natural resources at numerous sites across the world. When effectively employed to create and sustain information flow between rangers and conservation managers as part of the SMART Approach, SMART LEM will help to substantially improve protection of marine life and habitats.

Key Benefits:

- Empower rangers by:
  - Motivating them in their day-to-day work by optimizing the data collection process for patrol teams;
  - Using ranger data to demonstrate work effort and provide patrol teams with regular feedback and review, and to improve patrol management;
  - Ensuring accountability and good governance through clear and standardized measures of law enforcement performance for rangers and managers.

- Prioritize resources and plan patrols
  - SMART is user-friendly to help managers strategically plan and deploy their enforcement operations.
  - Integration of patrol data with intelligence data provides a more complete picture of illegal activities and perpetrators

- Demonstrate the impact of patrolling through
  - Rapid, accurate, and impactful interpretations and reporting of patrol data and enforcement activities
  - Tracking legal and administrative cases resulting from patrols and enforcement actions

Things to consider before implementation:

- For a detailed discussion of what to consider before implementing SMART LEM at your site, see the “Before You Start” and “Preparing for SMART Implementation” sections above.

Case Study: Marine Protected Area System, Belize

SMART adoption throughout Belize marine protected area system.

- SMART is implemented by the Belize Fisheries Department and NGO co-managers throughout the Belize Marine Protected Areas (MPA) for monitoring and MPA management.

- SMART use has resulted in the identification of patrol priority zones, more effective management and deployment of patrols and resources, and has led to an overall decrease in the number of fisheries infractions in MPAs.

Minimum Software/Hardware Requirements

SMART LEM is part of the base SMART Installation. In order to implement it, you will need a Computer (laptop or desktop) with Windows OS with min 4GB RAM (8 or higher recommended). SMART LEM requires that the basic SMART software program is installed and configured for your site(s).
SMART Mobile Data Collection with CyberTracker is the best solution for capturing data in protected areas. The mobile data collection component of SMART uses CyberTracker, a third-party platform created to simplify the collection of field data that has been successfully deployed in its own right in hundreds of sites around the world. SMART leverages the functionality of CyberTracker to eliminate the need for field observations to be recorded separately from GPS data. CyberTracker uses a GPS enabled mobile device (e.g., smartphone or PDA) to collect both observations (text or icon based data entry and digital images) and GPS data in a single unit. After a patrol returns to the office, observations and GPS data are transferred directly into the SMART database in a semi-automated process.

**Key Benefits:**

- Quickly record georeferenced field data without the need for additional data entry steps.
- Capture georeference photos to validate field observations
- Leverage SMART Connect, an online extension to SMART that allows real-time data transfer, to ‘connect’ rangers in the field to central command centers enabling more rapid and effective operational responses

**Things to consider before implementation:**

- Are there sufficient financial and technical resources at your site to implement data collection protocols utilizing mobile handheld devices?
- What are your patrol objectives (e.g., target species)?
- How should you structure your configurable data model to ensure data can be easily and unambiguously collected by rangers, while still effectively meeting your patrol objectives?
- Is there sufficient ranger capacity to collect data on a mobile handheld device? If not, have you developed a training plan?
- Have you developed hardware maintenance (e.g., routine care) and security protocols (e.g., lost/misplaced devices) to ensure accountability and lengthen the life of the devices?
- Is there wifi/cellular coverage at your site that could facilitate use of SMART Connect? If so, have you considered the benefits of Connect use at your site?

**Minimum Software/Hardware Requirements**

To use SMART Mobile Data Collection, you will need a Computer (laptop or desktop) with Windows OS (min 4GB RAM; 8 or higher recommended), the basic SMART and CyberTracker software programs installed and configured for your site(s). You will also need handheld mobile smartphone/tablet device(s) running either Windows Mobile or Android OS. Ideally, your devices should be ruggedized and have a waterproofing solution. Consider also, an external power solution (battery packs or battery plus solar panel combination) for your devices.
SMART Ecological Records

SMART Ecological Records (ER) is an optional plug-in that allows SMART users to capture, manage, map, and analyze data from systematic surveys of species, their habitats, and disturbances in a framework that closely resembles the SMART patrol framework. With standardized ecological monitoring, institutionalized with well-trained staff, SMART ER can provide information on species and habitat changes over space and time as well as providing an understanding of factors responsible for the changes. When effectively employed with other routine protected area activities, SMART ER enables integration of ecological and law enforcement monitoring data, providing protected area managers with a holistic status of their protected area and effectiveness of their conservation activities.

Key Benefits:

- Streamline collection of ecological data with a customizable data model that can be used for a variety of commonly applied field survey methods.
- Organize, map, and summarize ecological data and easily export for external analysis.
- Compile ecological and patrol data from your site(s) to create a holistic protected area management strategy.

Things to consider before implementation:

- What are your monitoring objectives?
- What variables should you collect data on to effectively monitor your conservation targets? Are these data able to be collected unambiguously by field staff?
- What is the appropriate sampling design and data collection protocol for your site, given your objectives and resources?
- Who will collect your ecological monitoring data, and are they appropriately trained in your data collection protocol?
- How will the data be analyzed, and how will the results be presented? Will the analyses effectively answer your initial questions about your target species and/or their habitats?
- Is there a mechanism in place to leverage your results for adaptive management or further conservation activities?

Case Study: Noubalé Ndoki National Park (NNNP) - Congo

SMART ER was used for an extensive large mammal survey in NNNP.

- A systematic line transect sampling strategy was designed for the NNNP landscape using SMART ER (below).
- Data were collected and analyzed on target species (e.g., elephants) and threat indicators (e.g., hunting camps).

Minimum Software/Hardware Requirements

In order to install SMART ER, you will need a computer (laptop or desktop) with Windows OS with min 4GB RAM (8 or higher recommended). SMART ER requires that the basic SMART software program is installed and configured for your site(s).
SMART Planning

Managers need to monitor staff performance and make constant adjustments to the allocation of human resources and equipment in order to maximize patrol efficiency. In order to accomplish this, SMART has an easy to use Planning function to support protected area managers with understanding whether patrol teams are achieving their targets on a periodic basis (per patrol, monthly, quarterly, etc.). The targets (numeric, spatial or administrative) are inputted into the Planning function, and can be defined for the entire conservation area, stations, teams or individual patrols. Plans can be associated with a patrol or series of patrols, which then uses GPS track information to calculate the success or failure of defined targets. When implemented effectively, SMART Planning can enhance decision-making and help optimize deployment of limited resources for conservation.

Key Benefits:

- Set objective and user-defined conservation targets (numeric, spatial or administrative) for the entire conservation area, stations, teams or individual patrols.
- Monitor temporal performance of patrols and leadership
- Improve data-driven decision-making and resource allocation
- Evaluate and track patrol and leadership performance on patrols and over time.

Things to consider before implementation:

- What are your patrol, enforcement, and monitoring objectives (e.g., kilometers walked, arrests, transects walked, etc.)?
- What variables should you collect data on to effectively meet/monitor conservation targets? Are these data able to be collected unambiguously by field staff?
- Targets should be achievable and realistic for the rangers, meaning that failure to meet the targets indicates a problem with performance levels.
- Targets can, in some situations, work well if linked to an incentive system - there needs to be both a reward for achieving the targets and a disincentive for underperformance.
- Targets should be adaptable and/or evolve over time, based on changing conditions within the conservation area.
- Is there a mechanism in place to leverage results and analyses for adaptive management or further conservation activities?

Case Study: Seima Protection Forest - Cambodia

Improving patrol performance through setting SMART patrol targets

- Setting of numeric and spatial targets using SMART demonstrated the power of decision-making informed by patrol data and provided guidance for patrol management.
- Example: Monthly spatial patrol targets are depicted by the red circles (at right). The patrols in the top figure failed to meet the targets; the patrols (blue tracklogs) focused almost entirely on an access road. In contrast, the patrols in the bottom figure reached all their spatial targets.
- SMART Planning is now routinely used at Seima to evaluate progress of patrol teams towards monthly targets, and to assess the performance of patrol team leaders.

Minimum Software/Hardware Requirements

SMART Planning is part of the basic SMART installation, requiring a Computer (laptop or desktop) with Windows OS with min 4GB RAM (8 or higher recommended) and the basic SMART software program installed and configured for your site(s).
SMART Connect

Connect is an online extension to SMART which can greatly enhance the ease and quickness with which users can translate patrol efforts in the field into actionable data for improving conservation practice at their site(s). Connect facilitates data capture as close to real time as a site’s infrastructure allows, making it possible for rangers to manage and respond to real time threats, and integration of SMART data with data from other sources (e.g., Global Forest Watch) and other commonly used field sensors, such as remote camera traps. Connect also allows for centralized management of SMART deployments, facilitating information sharing of data, maps, and reports across entire protected area or landscape networks, and enabling access to SMART reporting from non-SMART users. These added functionalities make SMART Connect an unparalleled tactical, operational, and analytical tool for conservation management.

Key Benefits:

- Collect and share field data in real time; manage and respond to real time alerts to enable more effective and rapid operational responses
- Centrally manage SMART deployments at multiple sites
- Enhance analysis, visualization, and impact of SMART data for decision-making by integrating with other systems

Things to consider before implementation:

- What are the threats, challenges, and high-level goals for your site? Will a technology solution (i.e., SMART Connect) help address these, or are there more systemic issues at your site?
- Is there reasonably reliable internet connectivity at your site?
- Is there adequate IT expertise at your site to configure, deploy, and administer a SMART Connect installation? If not, will you be able to recruit/train staff before implementing Connect?
- Do you have data security protocols in place? Or, are you capable of reliably implementing them at your site?
- Is there endorsement for SMART and Connect from higher level or central management (e.g., regional or national), that will manage the deployments as a group?
- Are you already implementing SMART desktop at your site(s), or will you need to configure and define a desktop application before implementing Connect? If not already implementing SMART, we recommend reviewing the “Before You Start” and “Preparing for SMART Implementation” sections above.

Case Study: Getting SMART with forest protection - Philippines

SMART enables data-driven management decisions at a national scale

- With over 3,000 data collectors spread across the 7,000 islands of the Philippines, the Philippines Dept. of Environment and Natural Resources required a centralized solution that made management of forest sectors more effective and efficient.
- SMART Connect now allows seamless aggregation of patrol data from over 200 sites (see coverage map at left) across provincial, regional and national levels, which provides faster access to updated information at all decision-making levels.

Minimum Software/Hardware Requirements

SMART Connect is an online extension to your existing SMART installation requiring that the basic SMART software is installed and configured for your site(s). In order to implement Connect, you will also need: 1) basic, but reliable internet connectivity, with a minimum speed of approximately 1 Mbps up and down, 2) cloud-based server space (e.g., from AWS) or a single, secure and reliable connected server onsite, 3) IT and information security expertise required to set-up server, troubleshoot, backup and recover data, and manage networks.
SMART Connect Sustainability

It is important to plan for the long-term sustainability of your SMART Connect implementation by carefully considering your options for deployment and ensuring ahead of time that you have sufficient finances and/or infrastructure to effectively deploy SMART Connect at your site.

Deploying SMART Connect in the Cloud

Using the ‘default’ settings (at right), the Amazon Web Services cost estimator suggests a monthly recurring cost of around $100. Based on pilot implementations, and taking into account increased usage over time, we recommend budgeting approximately $200-250 per month.

SMART Connect Framework

- EC2 using a custom Linux AMI on a t2.medium instance with a 24GB EBS volume
- RDS using Postgres on a db.t2.medium instance with 20GB of storage
- S3 bucket for file storage
- One encrypted keypair for access to EC2
- One Elastic IP address

Deploying SMART Connect on an on-premise server

Costs for an on-premise Connect deployment vary widely due to access to hardware, IT configuration and maintenance capacity, and local cost variability. As a result, we recommend deploying Connect to the cloud due to the high value proposition (i.e., relatively simple configuration and maintenance and low-costs); however, if you are interested in an on-site deployment, please contact info@smartconservationsoftware.org for more information.

SMART Connect: An Example

Rangers capture data on threats or positions (of animals or themselves)

Rangers send data from mobile units in the field

Transmitted to HQ as Connect alerts in real time

Management receives Connect alert and immediately responds

Rangers deployed in response

Rich mapping of simultaneous alerts enhances prioritizing responses
SMART Intelligence

Offenders thrive in anonymity, but SMART Intelligence deprives them of this, by providing conservation law enforcement officials with a robust platform for management of intelligence data. SMART Intelligence is a secure and highly queryable repository of sensitive multi-source information on individuals engaging in illegal activities within protected areas that can fulfill the needs of a protected area’s intelligence operations, and which, can readily be used in conjunction with powerful, compatible 3rd-party network analysis tools (e.g., Cytoscape, Gephi). Improving understanding of the offenders and their patterns of behavior enables enforcement officials to craft far more targeted strategies aimed at preventing the crimes before they occur in protected areas.

Key Benefits:

• Robustly and securely manage data from a range of possible sources, such as hotlines, interviews, reconnaissance, patrols, etc., to develop a comprehensive, temporal database of known and potential offenders
• Focus law enforcement monitoring efforts through patrol planning informed by comprehensive intelligence information, improving efficiency and reducing threats faced by enforcement officials through improper planning
• Export data and relationships as .csv files compatible with freely available, advanced intelligence analysis tools for network visualization and nodal analysis

Things to consider before implementation:

• Before you deploy SMART Intelligence, ensure that you are familiar with national laws and the legality of maintaining a database of personal information.
• The SMART Intelligence module should be set up in collaboration with a trainer experienced in intelligence information collection and management. Mistakes and haste in the initial system setup can cause unfortunate downstream limitations to the work.
• Security of intelligence is very important and staff that handle intelligence need to be well-trusted. Before live intelligence is loaded into your system, agree a set of protocols regarding who has access to SMART intelligence data and which computers the data will be stored on. Make sure that these computers, and the SMART database itself, are protected by strong passwords, and that computers are located in secure locations.
• Consider how the intelligence cycle (collection - processing - analysis - dissemination - planning) will work in your organization and plan, in detail, how intelligence will flow from where it is collected, to analysts, then to managers, and back to the front-line where decisions are acted-upon.
• Intelligence systems are only as good as the quality of the intelligence data stored within them. Staff that engage with intelligence operations will benefit from extra training focused on best-practice intelligence gathering and handling techniques.
• Consider the human capacity for collection and management of intelligence data at your site. You should plan to have established a number of capable individuals, including, at minimum, an:
  • Operational Manager. Responsible for directing information collection actions, acting as point of contact for access to information and liaising with other agencies.
  • Analyst. Responsible for analyzing and reporting on the information in the database.
  • Information collectors. Individuals responsible for gathering information and inputting this into the platform.
• SMART Intelligence is designed to handle information from diverse source types, e.g., identifying repeat offenders on patrol, gathering information from community contacts. We do not provide guidelines on how to collect information, but we strongly advise against initiating collecting beyond the field skills and requirement of your team.

Minimum Software/Hardware Requirements
To install SMART Intelligence, you will need a Computer (laptop or desktop) with Windows OS with min 4GB RAM (8 or higher recommended). SMART Intelligence requires that the basic SMART software program is installed and configured for your site(s).
SMART Support

Visit the SMART website (smartconservationtools.org) for more detailed information and additional support materials. Contact the SMART Program Manager at info@smartconservationsoftware.org if you have any questions.

MATERIALS
• Brochures
• Case Studies
• Videos
• Annual Reports

DOWNLOAD
• Current production version download
• Legacy version software downloads

SUPPORT
• Current & legacy version training manuals
• Additional support & training materials
• Demo database & data model

FORUM
• Google forum of SMART users
• > 280 members
• > 90% response within 1 week
• Best place for feedback & user community engagement