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MINISTRY OF STATE FOR ENVIRONMENTAL AFFAIRS
EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY
Nature Conservation Sector
Egypt Environmental Policy Program (EEPP)

**MANAGEMENT PLAN FOR WADI EL GEMAL NATIONAL
PARK**



July 2004

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Acronyms and Abbreviations

AOP	Annual Operation Plan
CITES	Convention on International Trade of Endangered Species
CMA	Conservation Management Area
CMS	Conservation of Migratory Species
DO	dissolved oxygen
EEAA	Egyptian Environmental Affairs Agency
EEPP	Egyptian Environmental Policy Program
Eh	oxidation-reduction potential
EU	European Union
EGSMA	Egyptian Geological Survey and Mining Authority
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
CMA	(South Red Sea) Conservation Management Area
GEF	Global Environment Facility
GOE	Government of Egypt
GOPP	General Organisation for Physical Planning
GAFRD	General Authority for Fisheries Resources Development
GAPS	General Authority for the Protection of Shores
GIS	Geographic Information System
HSD	Health Services Directorate (Governorate)
HEPCA	Hurghada Environmental Protection and Conservation Association
HW	high water
IBA	(globally) important bird area
IT	Information Technology
IUCN	International Union for Conservation of Nature (World Conservation Union)
LE	Egyptian Pound
LF	Logical Framework
LID	Low Intensity Development (zone)
LIFE	Livelihood and Income from the Environment Project
LUMP	Land Use Management Plan (TDA)
LW	low water
MOA	Ministry Of Agriculture
MSEA	Ministry of State for Environmental Affairs
NCS	Nature Conservation Sector
NW	northwest, northwesterly
PA	Protected Area
PAMU	Protected Area Management Unit
pH	measure of acidity or alkalinity
ppm	parts per million
PSU	Program Support Unit
RSG	Red Sea Governorate
RSSTI	Red Sea Sustainable Tourism Initiative Project
S	salinity
SCA	Supreme Council for Antiquities
SEA	Strategic Environmental Assessment
SFD	Social Fund for Development

Spec	specific conductivity
SZCMP	Southern Zone Conservation Management Plan
TDA	General Authority for Tourism Development
TDS	total dissolved salts
UNDP	United National Development Programme
USAID	United States Agency for International Development
WGPN	Wadi el-Gemal National Park
WHO	World Health Organization
WFP	World Food Program

Executive Summary

This is the revised Wadi el-Gemal National Park (WGNP) conservation management plan, approved by the Egyptian Environmental Affairs Agency (EEAA). It is a deliverable for the Egyptian Environmental Policy Program (EEPP) Tranche 2 Policy Measures, partially fulfilling Policy Measure 2.3: “EEAA develops a Red Sea Southern Zone Conservation Management Plan (SZCMP), including a mooring buoy strategy, for select high priority coral reefs, islands and terrestrial areas.” This plan is an annex to the SZCMP and focuses on managing the natural and cultural resources within WGNP, declared by Prime Ministerial Decree 134/2003.

WGNP was declared by the Government of Egypt (GOE) to ensure that existing and future pressures on the area’s natural resources are managed within an ecologically sustainable framework. The plan should maintain the traditional and characteristic culture of the local population and act as a regional planning tool, enhancing the robustness of sustainable economic output in the region.

The management plan reviews the protected area’s (PA) most outstanding resources and indicates their relative significance. National Park objectives are formulated based on national conservation goals set out in various statements, particularly the National Biodiversity Strategy and Action Plan (EEAA Nature Conservation Sector [NCS] 1998), and in conformity with international PA management standards established by the International Union for Conservation of Nature (IUCN). Management issues (problems, obligations, and opportunities) are identified, along with proposed policies and actions to be adopted by the NCS/EEAA. Management tools and resources are reviewed in detail. Guidelines for implementation, finance, and evaluation are provided.

Management Framework

The NCS/EEAA is the concerned body legally obliged to manage the National Park and apply relevant legal requirements under Law 102/1983, the Law for the Natural Protectorates, and to fulfill national conservation objectives. This management plan is meant to be a guiding tool to the NCS/EEAA staff entrusted with the administration of WGNP to facilitate their effective management of the region’s natural resources.

The management of WGNP is built upon experience gained in other national parks in Egypt. The management organization formally recognized as part of the NCS/EEAA structure is adopted here; i.e. an autonomous Protected Area Management Unit (PAMU), headed by the National Park Manager will administer the National Park. The PAMU will report to the Red Sea Regional PA Office in Hurghada, which in turn reports to NCS/EEAA, Cairo.

WGNP Resources

WGNP encompasses a great diversity of habitats in a uniquely compact setting, representing a complete terrestrial/marine ecosystem characteristic of the Red Sea coast. The region is of phenomenal natural beauty and outstanding biological diversity. The coral reefs of the WGNP are amongst the best and most diverse in the Egyptian Red Sea, and are home to a great diversity of fish and marine invertebrates. They have enormous economic value, providing the basis for international tourism activities and sustain locally important fisheries.

WGNP includes a significant proportion of the mangrove resources of Egypt. At Hamata, thickets of *Avicennia marina* extends for 12 km in a semi-continuous fringe, and form important nurseries for economically important fish and nesting sites for many of the region's waterbirds. Substantial seagrass beds provide food for the threatened Green Turtle, *Chelonia mydas* and Dugong, *Dugong dugon*. At least two species of marine turtles nest on islands, as well as on the mainland coast in the National Park, where some of the country's most important turtle nesting sites are found.

The interior of the National Park is a complex pristine mountain wilderness, inhabited by a diversity of wildlife including several endangered species, and representing an enormous resource for ecotourism activities. The Wadi el-Gemal watershed at 1476.7 km² is one of the largest drainage basins in the Eastern Desert. It is perhaps the best-vegetated wadi in the Eastern Desert, encompassing dense groves of *Tamarix sp.*, *Balanites aegyptiaca*, *Salvadora persica*, and *Acacia tortilis*, representing a unique relict of Sahalian vegetation. Table 1 gives an idea of the taxonomic groups that have been recorded in WGNP.

Table 1 Numbers of Species of Various Taxonomic Groups Recorded in WGNP

Group	Number of species
Algae	58
Seagrasses	7
Terrestrial flora	73
Coral (hard and soft)	86
Gastropods	96
Echinoderms	43
Fish	104
Reptiles	29
Birds	46
Mammals	29

There are 20 globally threatened species known from WGNP, the most significant of these (i.e. species for which WGNP can make an important contribution towards their global conservation) are: Marine turtles; Dugong; White-eyed Gull, *Larus leucophthalmus*; Dorcas Gazelle, *Gazella dorcas*; and Barbary Sheep, *Ammotragus lervia*.

People belonging to the Ababda Tribe, who still practice a traditional lifestyle largely in harmony with their environment, inhabit the area. The area has many archaeological sites along important historic trade routes linking the Red Sea with the Nile Valley. Natural systems are still intact and development in the area is still at its infancy, but is expected to pick up pace in the near future. Mining and quarrying are relatively widespread activities, and there are several inactive gold and emerald mines scattered throughout the area.

The WGNP declaration came within the framework of Egypt's declared Protected Area system plan, and during a period when public and professional concerns about the future status of natural resources near the Red Sea have increased. There was some urgency to establish a conservation framework for the region's resources that would ensure their long-term sustainability.

Management Category and Protected Area Objectives

WGNP is designated primarily as a National Park—a “protected area”—managed mainly for ecosystem protection and recreation. It falls into the IUCN's PA management category II, which defines the PA as a “natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational, and visitor opportunities, all of which must be environmentally and culturally compatible.”

WGNP fits the National Park criteria: It is of substantial size, encompassing a unique example of a complete marine/terrestrial ecosystem not significantly altered by man and largely in pristine natural condition, has outstanding landscape features, holds a significant recreational value, and has sites of important spiritual significance.

Accordingly, the main proposed management objectives for WGNP are:

- ◆ To maintain the natural resources and conditions of the PA
- ◆ To protect cultural heritage resources of the PA
- ◆ To enhance the sustainable utility of natural resources in the PA through the establishment of appropriate management systems
- ◆ To promote WGNP as a focal point for ecologically sensitive tourism, thus expanding and diversifying the economic activity base in the region
- ◆ To enhance the environmental quality of the WGNP
- ◆ To optimize socio-economic benefits to the indigenous population from the region's natural heritage

To promote public understanding and appreciation of Egypt's natural heritage.

Issues, Policies, and Actions

Thirty-one management issues have been identified. Management issues not only include problems that currently or potentially could degrade the values of WGNP, but also include opportunities (e.g. ecotourism development), as well as obligations for the Protected Area Management Unit (PAMU) such as visitor safety. For each, management approaches and specific actions have been identified, within a comprehensive framework reflecting and reinforcing the primary objectives of the PA.

Important issues include:

- ◆ Coastal development
- ◆ Managing development in “ecotourism development areas”
- ◆ Anchoring
- ◆ Abuse of cultural heritage
- ◆ Solid waste
- ◆ Mining and quarrying
- ◆ Increasing benefits to indigenous people
- ◆ Fishing

Tools

Zoning is a primary management tool. Nine internal management zones are proposed, with management guidelines provided for each zone, as shown in Table 2.

In addition, patrolling, law enforcement, monitoring, licensing, moorings, site and species action plans, signposting, and public awareness are recognized as important management tools for WGNP.

Table 2 WGNP Internal Management Zones

Name of Zone	Management Input	Permissible Impact Level
1. Strict Natural Zone	Low–moderate	Zero impact
2. Premium Wilderness Zone		
3. No-take Zone	High	Low impact
4. Recreational Zone		
5. Archaeological Protection Zone		
6. Traditional Use Zone	High	Moderate impact
7. Multiple Use Zone		
8. Ecotourism Development Zone		
9. Adjacent Area (Buffer Zone)	Moderate	Relatively high impact

Resources

It is anticipated the PAMU for WGNP will need to include about 50 staff members within the next 5 years to effectively manage the PA's resources and achieve stated objectives. The PAMU staff will include five ranks, starting with the PA Manager, Senior Rangers, Rangers, Junior Rangers, and Community Guards. WGNP is divided into three management sectors: northern, southern, and inland. Each sector would have a base office and its assigned staff. Initially the PAMU will be based in temporary office space at Shams Alam, at the northern end of the PA. Important management facilities for PAMU staff include patrolling vehicles and vessels, monitoring equipment, and housing.

Implementation and Priorities

The implementation of this plan will require that priorities be identified and addressed. Generally, the first priority is given to manage large-scale activities that are planned in the two "ecotourism development areas." These activities might have a geographically as well as ecologically significant footprint on the region. It is best to resolve such conflicts at the planning stage, rather than during implementation, or operation. Second priority is to halt or control the primary current adverse activities that are degrading the natural resource base of WGNP, and which will continue to do so unless management interventions are made by PAMU. Third priority can be given to public awareness and education. The enhancement of natural resources and promotion of the sustainable utility of resources (such as ecotourism) are proactive measures that seek to improve future utility of the natural resources of WGNP.

The integration and consultation of indigenous inhabitants should be a constant priority for the PAMU from Day One.

Site Management Plans

Site management plans are a management tool designed to provide specific and detailed guidance to PAMU staff for small, discrete sites of particular concern due to significant conservation importance and sensitivity. Such sites could be subject to exceptionally high human pressures. Pilot site management plans have been prepared for Ras Baghdadi and Wadi el-Gemal Island, and further plans are under preparation for Qulan Bay and the Sikait area. A site management plan has also been prepared for Samadai Reef (Dolphin House). The plan was developed by the EEAA, in consultation with local stakeholders and the Red Sea Governorate (RSG).

Plan Update and Review

This plan is meant to be flexible and should be regularly updated. It should be completely reviewed every 5 years. A yearly Operational Plan will be developed by the PAMU to translate this plan into clear and more practical and measurable actions and targets, associated with a detailed budget.

موجز خطة إدارة محمية وادي الجمال

صدر قرار رئيس الوزراء (٢٠٠٣/١٣٤) الخاص بإعلان محمية وادي الجمال بهدف ضمان إدارة الضغوط الحالية والمستقبلية علي الموارد الطبيعية للمنطقة وذلك في إطار نظام ايكولوجي مستدام , يحافظ علي الخصائص الثقافية والتقليدية للمجتمع المحلي.

وتستعرض خطة الإدارة أهم الموارد المتميزة في المحمية وتحدد الأهمية النسبية لكل منها. تحددت أهداف المحمية علي أساس الأهداف القومية لصيانة الطبيعة والتي تم التعبير عنها في العديد من البيانات والدراسات وخاصة استراتيجية وخطة عمل التنوع البيولوجي الوطنية (NCS 1998) وتمشياً مع المعايير الدولية لإدارة المحميات التي أقرها الاتحاد الدولي لصون الطبيعة IUCN. وتحدد الإستراتيجية الوطنية الأمور المتعلقة بالإدارة بما في ذلك المشاكل والالتزامات والفرص وكذلك السياسات المقترحة والخطوات الواجب تنفيذها. كما تم مراجعة أدوات الإدارة ومواردها بالتفصيل وإعداد الخطوط الإرشادية لتطبيقها وتمويلها وتقييمها.

إطار الإدارة وتشكيلها

الإدارة المركزية لحماية الطبيعة التابعة لجهاز شئون البيئة هي الجهة المسؤولة عن إدارة هذه المحمية وضمان الالتزام بتطبيق القواعد المنصوص عليها في القانون رقم ١٠٢ لسنة ١٩٨٣ الخاص بالمحميات الطبيعية، ولتحقيق أهداف الصيانة الوطنية. وقد تم إعداد خطة الإدارة هذه لتكون أداة توجيهية للعاملين في المحمية لإدارة محمية وادي الجمال وذلك لتسهيل قيامهم بإدارة الموارد الطبيعية في هذه المنطقة بشكل فعال.

وقد تم الاستفادة في إعداد خطة إدارة محمية وادي الجمال من التجارب المكتسبة في إدارة محميات طبيعية أخرى في مصر. وقد تم في هذه الخطة أيضاً تطبيق الهيكل الإداري الذي تم إقراره من قبل باعتبار المحمية جزءاً من الإدارة المركزية لحماية الطبيعة التابع لجهاز شئون البيئة. أي إن مسؤولية إدارة هذه المحمية ستكون لوحدة إدارة المحمية والتي يرأسها مدير المحمية، وهي ستكون مسؤولة أمام المكتب الإقليمي لمحميات البحر الأحمر بالغرندقة والذي يتعامل مباشرة مع الإدارة المركزية بالقاهرة.

موارد محمية وادي الجمال الطبيعية

تضم محمية وادي الجمال الطبيعية تنوعاً هائلاً من الموائل المتجمعة في موقع فريد في نوعه، حيث تتمثل فيه الخصائص الايكولوجية البرية والبحرية لسواحل البحر الأحمر. وتتمتع هذه المنطقة بمناظر طبيعية خلابة وتنوع بيولوجي مميز. كما إن الشعاب المرجانية بهذه المنطقة من أفضلها وأكثرها تنوعاً في منطقة البحر الأحمر المصرية بالإضافة إلي أنها موطن لتنوع كبير من الأسماك واللافقاريات البحرية والتي لها قيمة اقتصادية كبيرة. إذ تعتبر أساساً للأنشطة السياحية بالمنطقة، كما أنها تمد المجتمعات المحلية بكميات كبيرة من الأسماك. وتضم محمية وادي الجمال جزءاً كبيراً من موارد المانجروف في مصر. ففي حماطة يمتد المانجروف من نوع *Avicennia marina* لمسافة ١٢ كم في حافة رائعة شبة مستمرة، تشكل حضانات لأنواع من الأسماك ذات الأهمية الاقتصادية بالإضافة إلي مواقع أعشاش للعديد من الطيور البحرية الموجودة بالمنطقة. كما أن مراعي الأعشاب البحرية توفر الغذاء

لعرائس البحر وللسحفاة الخضراء المهدة بالانقراض، وهناك علي الأقل نوعين من السلاحف البحرية تعيش في الجزر وعلي شواطئ هذه المحمية حيث توجد بعض أهم مواقع تكاثر السلاحف البحرية في البلاد.

وتوجد داخل المحمية بيئات جبلية لا تزال علي فطرتها الطبيعية وتعيش فيها أنواع متعددة من الحيوانات البرية بما في ذلك العديد من الأنواع المهدة بالانقراض والتي تمثل مورداً هاماً لأنشطة السياحة البيئية. أما وادي الجمال الذي يبلغ مساحته ٤٧٦,٧ كم^٢ فهو واحد من أكبر أحواض الصرف في صحراء مصر الشرقية. ولعل هذا الوادي أهم الوديان في الصحراء الشرقية من ناحية الكساء الخضري الذي يحتوي علي تجمعات نباتية كثيفة من أشجار اللالوب *Balanites sp.* والأثل *Tamarix sp.* والسيال *Acacia tortillis* والأراك *Salvadora persica* وهذا يمثل نموذجاً فريداً من نباتات منطقة الساحل الأفريقي.

أعداد الأنواع من المجموعات التصنيفية المختلفة التي تم تسجيلها في محمية وادي الجمال

عدد الأنواع	المجموعة
٥٨	طحالب
٧	حشائش بحرية
٧٣	نباتات برية
٨٦	شعاب مرجانية صلبة ورخوة
٩٦	حيوانات رخوية
٤٣	جلد شوكلات
١٠٤	أسماك
٢٩	زواحف
٤٦	طيور
٢٩	ثدييات

وهناك عشرين نوعاً من تلك المصنفة دولياً بأنها مهدة بالانقراض موجودة في محمية وادي الجمال الطبيعية ولعل أبرزها السلاحف البحرية وعروس البحر والنورس العجمة والغزال المصري والكبش الأروي ويمكن لمحمية وادي الجمال أن تساهم بشكل فعال في الجهود العالمية لصون هذه الأنواع.

وبالمحمية مراعي تستفيد منها قبيلة العباددة التي لا تزال تعيش بطريقتها التقليدية في تجانس تام مع البيئة من حولها. كما توجد أيضاً مواقع أثرية هامة علي طريق التجارة القديم بين البحر الأحمر ووادي النيل. هذا بالإضافة إلي أن معدلات تنمية هذه المنطقة لا تزال في مراحلها الأولية وإن كان من المتوقع أن تتزايد في المستقبل القريب. وتنتشر بالمحمية إلي حد ما المناجم والمحاجر وبها أيضاً (في مواقع متناثرة) بعض مناجم الذهب والزمرد القديمة وغير العاملة حالياً.

وقد جاء إعلان وادي الجمال كمنطقة محمية ضمن إطار خطة مصر لصون مواردها الطبيعية واهتمام المتخصصين والجمهور علي حد سواء بمستقبل الموارد الطبيعية علي البحر الأحمر. ومن ثم كان هناك حاجة ملحة لإعداد إطار للحفاظ علي الموارد الطبيعية في هذه المنطقة لضمان استدامتها علي المدى الطويل.

فئة الإدارة وأهداف المحمية

صممت خطة صون محمية وادي الجمال كمحمية تدار أساساً بغرض حماية النظم الأيكولوجية بها مع استخدامها أيضاً في أغراض الترفيه، وقد صنفت باعتبارها محمية من الفئة ٢ حسب تصنيف الاتحاد الدولي لصون الطبيعة IUCN وتعرف هذه الفئة بأنها مساحة من الأرض أو البحر يتم إدارتها للأغراض التالية (أ) الحفاظ علي التكامل الأيكولوجي لواحدة أو أكثر من النظم الأيكولوجية للجبل الحالي وللأجيال القادمة. (ب) استبعاد الاستغلال المخالف والمتعارض مع الأغراض التي خصصت لها المحمية. (ج) إيجاد قاعدة لإتاحة الفرص للزوار للاستمتاع بالجوانب الروحية والعلمية والتعليمية والترفيهية بحيث تكون كل هذه الأنشطة متوافقة مع البيئة ومع الجوانب الثقافية.

والواقع أن هذه المعايير لتحديد المحميات الطبيعية تنطبق علي محمية وادي الجمال من حيث حجمها الذي يمكن الحفاظ عليه واحتوائها علي نوعيات نادرة وفريدة من النظم الأيكولوجية البحرية والبرية والتي لم تتغير بشكل ملموس بالأنشطة السكانية والتي لا تزال إلي حد كبير في حالتها الفطرية وتحتوي علي معالم ومناظر طبيعية خلابة ولها قيمة ترفيهية عالية بالإضافة إلي أهميتها الروحية الكبيرة.

الأهداف المقترحة لإدارة محمية وادي الجمال الطبيعية:

- ١- الحفاظ علي الموارد والظروف الطبيعية للمحمية.
- ٢- الحفاظ علي موارد التراث الثقافي للمحمية.
- ٣- تعزيز الاستخدام المستدام للموارد الطبيعية في المحمية وذلك بإنشاء نظم إدارة مناسبة.
- ٤- تعزيز محمية وادي الجمال الطبيعية كمركز للسياحة البيئية ومن ثم التوسع وزيادة التنوع في قاعدة الأنشطة الاقتصادية في المنطقة.
- ٥- تحسين نوعية البيئة في محمية وادي الجمال الطبيعية.
- ٦- زيادة الاستفادة الاقتصادية والاجتماعية للسكان الأصليين إلي أقصى حد من التراث الطبيعي بالمنطقة.
- ٧- تعزيز التفهم والوعي الجماهيري بأهمية التراث الطبيعي لمصر.

قضايا الإدارة والسياسات والخطوات الإدارية

تم تحديد ٣١ قضية أو موضوع يتعلّق بإدارة المحمية، ولا تتعلّق فقط بالمشاكل الحالية وإنما تشمل ما قد ينشأ مستقبلاً. هذا بالإضافة إلي الفرص المتاحة (مثل تنمية السياحة البيئية) كما تضم أيضاً التزامات إدارة المحمية (مثل سلامة الزوار). وقد تم إعداد منهج إدارة لكل موضوع وكذلك الخطوات المحددة لتنفيذه وذلك ي إطار شامل يعكس الأهداف الأساسية للمحمية ويعززها.

أدوات الإدارة

من أهم أدوات الإدارة في المحميات هو تحديد نطاقات الإدارة الداخلية (zoning). وقد اقترح تقسيم محمية وادي الجمال إلي تسع نطاقات داخلية وتم إعداد خطوط إرشادية لإدارة كل منطقة حسب أهميتها

وحساسيتها. وبالإضافة إلي ذلك فهناك دوريات مراقبة وأفراد للمتابعة وإصدار التراخيص. وتم إعداد خطط إدارة لحماية المواقع ذات الأهمية الخاصة (Site Management Plan) والأنواع المهددة بالانقراض وكذلك إعداد لافتات إرشادية وزيادة وعي الجماهير باعتبارها كلها من أدوات إدارة المحمية.

نطاقات الإدارة الداخلية ١,١,١,١

أسم النطاق	مدخلات الإدارة	مستوي الأثر المسموح به
١- نطاق طبيعي صرف	منخفض- متوسط	لا أثر
٢- نطاق طبيعي متميز	مرتفع	منخفض
٣- نطاق لا يسمح بالصيد البحري فيه	مرتفع	متوسط
٤- نطاق ترفيهي	مرتفع	متوسط
٥- نطاق حماية الحفريات والآثار	مرتفع	متوسط
٦- نطاق استخدام تقليدي	مرتفع	متوسط
٧- نطاق متعدد الاستخدام	متوسط	مرتفع نسبياً
٨- نطاق تنمية السياحة البيئية	متوسط	مرتفع نسبياً
٩- نطاق مجاور (منطقة عازلة)	متوسط	مرتفع نسبياً

موارد الإدارة

من المتوقع أن تحتاج إدارة محمية وادي الجمال إلي خمسين موظفاً علي مدي الخمس سنوات القادمة حتى تتمكن من إدارة المحمية ومواردها بشكل فعال وحتى تتمكن من تحقيق الأهداف المحددة لها. وسوف تضم الإدارة خمس مستويات للعاملين، تبدأ بمدير المحمية ثم كبار حراس البيئة ثم صغار الحراس ثم العاملين من المجتمع المحلي، ويقسم هؤلاء إلي ثلاث قطاعات للإدارة الشمالي والجنوبي والداخلي. وسيكون لكل قطاع مكتب رئيسي بموظفيه. وفي البداية سيكون مقر وحدة الصون في شمس علم في المنطقة الشمالية للمحمية. وتتضمن وسائل الإدارة سيارات وقوارب للمراقبة ومعدات للرصد وسكن للعاملين.

أهم قضايا إدارة المحمية

- التنمية الساحلية غير المنظمة.
- إدارة مناطق تنمية السياحة البيئية.
- الشمندورات.
- الممارسات ذات التأثير السلبي على التراث الثقافي.
- إدارة المخلفات الصلبة.
- المناجم والمحاجر.
- زيادة المنافع للسكان الأصليين.
- مصايد الأسماك و الصيد البحري.

تنفيذ الخطة وأولويات الإدارة

يتطلب تنفيذ هذه الخطة تحديد الأولويات وكيفية تنفيذها. وعادة ما تكون الأولوية لإدارة الأنشطة الكبرى المخطط تنفيذها في "مناطق تنمية السياحة البيئية". وقد يكون لهذه الأنشطة أثراً هاماً من الناحية الجغرافية والبيئية على المنطقة، ولذلك من الأهمية بمكان التوصل إلى اتفاق بشأن هذه الأمور في مرحلة التخطيط بدلاً من القيام بذلك أثناء تنفيذ الخطة أو تطبيقها. أما الأولوية الثانية فهي وقف الأنشطة الضارة التي تهدد الموارد الطبيعية وتسبب في القضاء عليها، ذلك أن هذه الأنشطة سوف تستمر ما لم تتدخل وحدة إدارة المحمية لوقفها والسيطرة عليها. وثالث الأولويات هي نشر الوعي الجماهيري والتثقيفي. ويعتبر الحفاظ على الموارد الطبيعية وضمان الاستخدام المستدام لموارد المحمية (مثل السياحة البيئية) من أهم الإجراءات التي ستنفذ لتحسين استخدام الموارد الطبيعية في محمية وادي الجمال. وسيكون التشاور مع السكان الأصليين وإشراكهم في الاهتمام بمحمية وادي الجمال من الأولويات الدائمة لوحدة إدارة المحمية منذ اليوم الأول.

خطط إدارة المواقع

يتم تصميم خطط إدارة المواقع بحيث توفر إرشادات محددة وتفصيلية للعاملين في وحدة إدارة المحمية وخاصة فيما يتعلق بإدارة المواقع المتميزة ذات الأهمية الخاصة بالنسبة لصون الطبيعة والتي قد تتعرض لضغوط استخدام بشرية مكثفة. وقد تم إعداد خطط إدارية إرشادية لموقع جزيرة راس بغدادي ووادي الجمال. وهناك خطط أخرى تم إعدادها أيضاً للشعاب المرجانية في صمداي (بيت الدرافيل). وقد أعد جهاز شؤون البيئة هذه الخطة بالتشاور مع المنتفعين بالبحر الأحمر.

مراجعة الخطة وتحديثها

أعدت هذه الخطة بحيث تكون مرنة ويمكن تحديثها من حين لآخر حسب ما يستجد من ظروف، ويجب أن تتم مراجعتها كلية كل خمس سنوات. كما ستعد وحدة إدارة المحمية خطة سنوية للتشغيل لترجمة هذه الخطة إلى أنشطة واضحة وواقعية يمكن تحقيقها وإلي أهداف محددة، كما ستشمل الميزانية اللازمة لتنفيذها.

1. Introduction

Egypt declared its commitment to enhancing environmental quality and the promotion of sustainable use of its natural resources as a strategic choice for the future of the country. The GOE has adopted a National Biodiversity Strategy and Action Plan (NCS 1998), that calls for the establishment and maintenance of a network of representative Protected Areas (PA) in the country.



Since the passage of the cornerstone legislation mandating the establishment of PAs (Law 102/1983), Egypt has established 24 PAs covering 95,000 km² representing more than 9 percent of the nation's territory. These valuable segments of the country represent a legacy and a reservoir for future generations. The PA model has proven to be one of the most effective natural and cultural resource management tools in the Egyptian context. In several cases, PAs have proven to be an essential asset to regional development, as is the case in South Sinai. Excellent partnerships have developed between PAs and compatible users, the tourism industry in particular. This has shown that PAs are not merely closed areas that do not contribute to the national economy, but are valuable assets that can be highly productive if appropriately managed (Fouda 2002).

As part of Egypt's drive towards rational and sustainable use of its natural resources, the Wadi el-Gemal National Park was declared in January 2003 by Prime Ministerial Decree 143/2003 under Law 102/1983 concerning PAs, making it the 24th PA to be declared to date. This was the outcome of technical facilitation provided by the Egyptian Environmental Policy Program–Program Support Unit (EEPP–PSU) in cooperation with the EEAA.

The EEPP workplan called for the establishment of a management plan for WGNP as part of the Southern Zone of the Red Sea Conservation Management Plan. WGNP is situated in a central location in the Southern Red Sea Conservation Management Area (CMA) and occupies a substantial part of its territory. The status of WGNP under the provisions of Law 102/1983, gives extensive authority for the EEAA to manage the resources of the region effectively. Thus, the WGNP Management Plan is a central and focal component of the Southern Red Sea Conservation Management Plan.

Plan Purpose

The WGNP management plan aims at facilitating the fulfillment of the PA's main objectives, through ensuring that existing and future pressures on the area's natural values are managed within an ecologically sustainable framework, maintaining the traditional and characteristic culture of the local population and acting as a regional

planning tool to diversify land use along the Red Sea coast. Further, the plan should enhance the robustness of future economic output in the region.

Specifically, the plan provides a review of the resources, opportunities, and problems in the PA. Based on these, management policies and specific actions are identified within a comprehensive framework. Zoning is a primary management tool, with guidelines provided for specific zones. Site management plans are proposed for particular resource hotspots. Detailed instructions are provided to the PA manger and staff.

Framework of the WGNP Management Plan

The management of the WGNP is the responsibility of EEAA's Nature Conservation Sector, the body responsible for the management of the National PA Network under the Ministry of State for Environmental Affairs (MSEA).

The management of PAs in Egypt is subject to the provisions of Law 102/1983, which outlines and identifies the basic legal framework for managing a PA. PAs in Egypt have a standard management and administrative structure, sanctioned by the NCS/EEAA. The NCS has developed and adopted management planning approaches that are being applied to the National PA Network. The WGNP management plan was developed within this existing framework, taking into consideration local needs and limitations. Standardization and conformity with national level processes will facilitate both smooth day-to-day, on the ground management of the PA, as well as strengthen and streamline the national PA management capacity.

This management plan is specifically designed to guide the management by the NCS/EEAA of the natural resources in WGNP according to its legal mandate and obligations under Laws 102/1983 and 4/1994. Stakeholder consultation and participation in the WGNP management planning process is an important component for its development.

This plan should not be viewed in isolation, but as an integral component of a suite of complementary management practices that should occur in the region adjacent to the PA. These include fisheries and hunting regulations, wildlife protection, pollution control, and environmental impact assessment, as well as maritime transport and safety measures (see CMA Management Plan).

Legal Framework

LAW 102/1983 PROTECTED AREAS LAW

The main PA legislative instrument, Law 102/1983 sets out the principles for the declaration of PAs and stipulates development restrictions and prohibited activities within and adjacent to the PA.

The law obliges the EEAA, as the concerned administrative body, to:

1. Forbid actions leading to the destruction or deterioration of the natural environment and biota or which would detract from the aesthetic standards of the PA.
2. Regulate scientific research.
3. Develop management plans for declared PAs.
4. Increase public awareness.
5. Regulate recreational activities in PAs to protect natural resources.
6. Establish control systems to enforce regulatory measures.

Article 3 of Law 102/1983 states, “It is forbidden to undertake activities or experiments in the areas surrounding designated protectorates [i.e. buffer or adjacent zone], which will have an effect on the PA’s environment and nature, except with the permission of the concerned administrative body.”

In addition, the law established the “Protected Area Fund” specifically to finance the management of PAs. This fund includes all revenues from donations, grants, sales, entrance fees, fines, and subsidies. According to Article 6, the fund can be used for:

- ◆ Supplementing the EEAA’s budget.
- ◆ Enhancing the protectorates.
- ◆ Undertaking surveys and field research.
- ◆ Rewarding persons who provide information on offences or who apprehend offenders.

PRIME MINISTERIAL DECREE 1067/1983

This decree designates the EEAA as the authorized body to apply Law 102.

PRIME MINISTERIAL DECREE 264/1994

This decree sets out conditions, rules, and procedures for definition and regulation of activities in natural reserve areas and provides the NCS/EEAA with executive administrative authority over natural protectorates. It has six articles and various conditions and rules and expressly forbids construction or development of any type without the permission of the EEAA.

PRIME MINISTERIAL DECREES 450/1986 AND 642/1995

These decrees established the Elba PA, which includes all Egyptian Red Sea islands, and the adjacent waters out to 1 km (22 islands) and all mangroves south of latitude 27°15’.

PRIME MINISTERIAL DECREE 134/2003

This is the decree that established WGNP.

LAW 4/1994 LAW OF THE ENVIRONMENT

Known as the environmental law, it establishes the principles and procedures to address environmental issues in Egypt. This comprehensive law includes measures to address terrestrial, air, and water pollution. Law 4 notes that the EEAA has the power to

administer and supervise PAs. Importantly, the law specifies that all development is required to go through an appropriate Environmental Impact Assessment (EIA) process.

Article 59 prohibits construction of any establishment within 200 meters of the shoreline, except with the approval of the Egyptian General Authority for the Protection of Shores (GAPS), in co-ordination with EEAA, and after the approval of a satisfactory EIA. Article 60 prohibits all activities that cause any alteration or modification to the natural shoreline.

Law 4/1994 also prohibits the hunting, possession, transport, and sale of those species of wild fauna (alive or dead) determined by Executive Statutes of the same law.

LAW 2/1973

This law authorizes the Ministry of Tourism to be the administrative body for the supervision and exploitation of tourism areas.

LAW 117/1983

This law provides for the protection of antiquities and historical sites.

PRESIDENTIAL DECREE 374/1991

This decree established the General Authority for Tourism Development (TDA) to be responsible for allocation and sale of land in designated tourism areas. The local governorate approves development within recognized boundaries of urban areas.

MINISTRY OF JUSTICE DECREE 1611/1989

This decree granted “police powers” to the manager of the EEAA governorate branch in which there is a PA and to the manager of the PA.

MINISTRY OF JUSTICE DECREE 1353/1996

This decree vested certain employees of the EEAA, including Managers of Natural PAs, with the capacity of “Judiciary Seizure Officers” relative to infringements of the Environmental Code enacted by Law 4/1994 and its Bylaws, relative to their competence.

LAW 53/1966

Known as the Agriculture Law, this defines wild fauna protection regulations.

MINISTRY OF AGRICULTURE DECREES 28/1967, 5/1983, 66/1983, 1227/1998, AND 90/1990

These decrees list protected species in Egypt (12 mammals, 13 reptiles, and more than 100 birds).

LAW 124/1983

Known as the Fisheries Law, this deals with all living aquatic resources, fishing grounds, vessels, fishing methods, pollution, licensing, fees, penalties, and other matters.

PRESIDENTIAL DECREES 190/1983, 465/1983, AND 362/1984

Presidential Decree 190/1983 created the General Authority for Fisheries Resources Development (GAFRD). Presidential Decree 465/83 gave the GAFRD the right and obligation to supervise, administer, and monitor the fisheries of Egypt. Presidential Decree 362/1984 declared that all license fees due from fishermen and fishing vessels are the property of the authority.

International Obligations

Egypt has ratified or signed a number of conservation-related international conventions including the Convention on the Conservation of Migratory Species (CMS), known as the Bonn Convention; Ramsar Convention; the Convention on International Trade of Endangered Species (CITES); Biodiversity Convention; the African Convention on Conservation of Nature and Natural Resources; and the convention concerning the Protection of the World Cultural and Natural Heritage.

Area Covered by the Plan

This management plan addresses the area of land and sea defined in Prime Ministerial Decree 143/2003 declaring WGNP (Appendix 1). The decree describes the boundary of WGNP with 14 geographical coordinates (Map 1—note that all maps are to be found at the back of this report), including an area of 4,770 km² of land, in addition to about 2,000 km² of marine waters. The decree also designates the boundary of two areas dedicated within WGNP as “ecotourism development areas,” one in the north at Ras Honkorab (22.3 km²) and another larger one in the middle section of the PA including the community of Abu Ghusoon (41.9 km²). According to the PA declaration, the development areas are to be utilized for ecotourism.

WGNP is situated in the Red Sea Governorate approximately 50 km south of Marsa Alam. The PA encompasses a segment of the Red Sea coastal plain (about 70 km of coastline, including the ecotourism development areas) and mountains extending roughly between 24°52'N in the north and 24°05'N in the south; and between the Red Sea shoreline in the east to about 34°28'E in the west (the Sheikh Shazli road). The PA also includes Qurat el-Hartway Bay and a section of the marine environment including the islands of Hamata and Wadi el-Gemal Island.

Planning Period

The operational period for this management plan is 5 years, from 2003–08. However, as situations change over time and new information becomes available, it is essential that some sections of this document be regularly updated and that a comprehensive revision is undertaken every 5 years. The PA Manager should initiate the review process and supervise intervening amendments.

Consultations and Approvals

A first draft of this plan was first available to the public during a workshop held at the Shams Alam Resort near WGNP in June 2003. Key stakeholders were present and provided feedback on the plan. The Red Sea Governor approved the first draft of this plan with no comments or reservations. Comments and questions from the TDA were received in writing and during three technical meetings in January and February 2004. These comments and questions have been addressed in this volume or clarified in official correspondence from EEAA to TDA.

Plan Structure

This plan largely follows a structure developed by the NCS/EEAA and IUCN for use in Egypt's PA Network in May 2002. It starts with a description of the PA and its resources and overview of its legal and socio-economic setting. Next, it reviews proposed management objectives, and provides an extensive appraisal of management issues along with proposed policies, and actions to address them. An overview of management tools and resources follows, and funding issues are discussed and a proposed budget provided. Finally, there is a brief discussion of implementation and evaluation. Additional supportive information and maps are provided in appendices.

WGNP's Roles

The PA will facilitate maintenance of the natural and cultural resources of the region, through ensuring that existing and future pressures on the area's natural resources are managed within an ecologically sustainable framework, maintaining the traditional and characteristic culture of the local population. The PA also functions as a regional planning tool, diversifying land use along the Red Sea coast and, enhancing the robustness of future economic output in the region. The PA is critical in conserving biological components characteristic of the Red Sea littoral plain, which is not represented in any other PA in Egypt. It will also play an important role in the conservation of several highly endangered mammals and their habitats. Cultural heritage resources will certainly benefit from regular patrolling and presence of PA staff. Visitor regulations will introduce a badly needed element of supervision in this region. The PA would also promote controlled visitation to the sites.

WGPA provides a management tool to better cope with an expected increase in human use of this area. This reflects a proactive approach to managing the human usage of the area rather than implementing reactive management strategies. The value of WGNP will become increasingly apparent, when large stretches of the Red Sea coastline are occupied by manmade structures, and visitors seek to experience the original natural setting of the Red Sea. Here the PA will play a critical (and even an ethical) role in preserving not only natural resources and biological diversity, but also options for future generations—the

option to see some of the coast in its natural state, to establish alternative development patterns, and to utilize available natural resources in a different fashion.

The NP has constructed a vision statement to guide its activities and priorities:

“Wadi el-Gemal National Park and its invaluable natural and cultural resources will be established as a world class attraction and an important regional asset for sustainable economic growth; as a result of systematic, responsive, and effective management and promotion of its resources.”

2. Description of Resources

Physical Description

WGNP includes marine and terrestrial components. The terrestrial component encompasses a substantial segment of the Red Sea hills and coastal desert. Wadi el-Gemal and its delta are the focal attraction of the PA, which encompasses the entire watershed of the wadi. However, the PA takes in other adjacent desert and marine habitats, which complement the wadi both ecologically and functionally (i.e. in terms of representing a meaningful management unit). Wadi el-Gemal is the third largest wadi in the Eastern Desert draining into the Red Sea, and one of the best vegetated, with an estimated watershed area of some 1,476.7 km² (Mansour 2003). The wadi watershed includes the northern flanks of Gebel Hamata in the south, as well as the southern flanks of Gebel Nugrus in the north. Several other important wadis are encompassed in the PA: Wadi Abu Ghusoon, Wadi el-Ranga, and Wadi el-Rada. Several important peaks are included: Gebel Hamata, Gebel Nugrus, Gebel Hafafeet, Gebel Hamamid, Gebel Sartut, and Gebel Sikait.

The shores of the region are heterogeneous in nature encompassing rocky, sandy, and muddy beaches. The coastline has several important landmarks such as the headlands of Ras Baghdadi and Ras Honkorab, Sharm el-Luli, and Qurat el-Hartway Bay.

The marine component of the PA encompasses a strip of marine waters of 15 km average width. This component includes all the important coral reefs in the region, as well as five marine islands (the Hamata archipelago and Wadi el-Gemal Island, plus several minute sandy islets).

Climate

Wadi el-Gemal National Park falls within the hyper-arid region characterized by arid climate and dominated by hot, rainless summers and mild winters. Precipitation falls mainly in the autumn and winter months, but is not an annual event; rather it is episodic and localized; often received in the form of short, heavy downpours causing flash flooding. The average annual precipitation is about 17.4 mm (meteorological stations of Ras Banas). The maximum amount of precipitation recorded in one day was 64 mm (24 November 1966). The monthly mean temperature varies between 24–38°C during summer and 12–26°C during winter. The relative humidity varies between 28 percent in summer and 57 percent in winter. The average evapo-transpiration varies between 8.7mm/day in winter and 28mm/day in summer. According to the above-mentioned climatic parameters, the area from Marsa Alam to Ras Banas receives an average rainfall of 98.78 million m³/year (Mansour 2003, Table 2).

Over much of the year, northwesterly (NW) winds predominate; only in rare cases do southern winds occur. The wind velocity usually ranges between 66.07 and 0.129 km/h with an average of 22.04 km/h in summer and between 62.93 and 0.096 km/h with an average of 19.26 km/h in winter (Meteorological Station Inst. Oceanography and Fisheries, Red Sea Branch). In general, wind velocity is distinctly higher during the daytime, a phenomenon that can be explained by the higher temperature differences between the heated landmass and cool seawater during the day. NW winds blow litter onto coastal areas and islands.

Oceanography

The direction and speed of currents in Egypt's Red Sea have not been described in detail. Sea surface currents typically flow in the same direction as the prevailing wind. In the Red Sea, the prevailing wind off Egypt is N–NW for most of the year, with a more western component from December to February (NOSCP 1997). Therefore, near the shore, sea surface currents, particularly in the south, flow north to south, parallel to the Egyptian coast. The direction and speed of subsurface currents in the same area are less predictable.

Winds also create a mainly NE–SW oriented wave motion. This leads to higher waves in exposed areas, and drives longshore currents. This current drives surface water southward in summer. The reverse takes place in winter, pushing water into the Red Sea from the Gulf of Aden. The marine area around the islands and along the coast is subjected to the wave action and therefore some areas are considered erosion zones. Because of nearly permanent air- and water- turbulence, a complete mixing of the water column occurs and no stratification develops inside the water body. This is reflected by the values of temperature and salinity, which show no significant differences between surface and bottom waters (Piller & Pervesler 1989).

Tides and tidal streams within WGNP presumably reflect those recorded in other areas of the northern Red Sea. That is, the tide is semidiurnal, with high water (HW) and low water (LW) occurring more or less simultaneously all along the northern Red Sea (Davies & Morgan 1995). HW is about 1–1.5 hrs. after LW at Shadwan Island, Egypt. The spring tidal range is 0.6–1.2 m.

In the northern Red Sea (30°N), water temperatures range from 17°C in February to 27°C in August (Davies & Morgan 1995), with greater extremes in shallow water near the coast. This compares with the southern Red Sea (15°N), where the seasonal range of water temperature is considerably less, but mean monthly temperatures are much greater (for example 26°C in February and > 31°C in August).

Seasonal tides in the Red Sea in winter are more than 0.5 m higher than in summer. The tide is semidiurnal, maximum peak every 12 h, with a mean tidal range of about 0.65 m and maximum of about 0.95 m in the area of the islands.

Water Quality

Water masses of the central-northern Red Sea have low levels of nutrients. Nevertheless, there is a clear latitudinal pattern in concentrations (Medio *et al.* 2000) with levels decreasing from south to north. In summer, nutrient rich water from the Gulf of Aden enters the Red Sea and flows as far north as the Farasan Islands, Saudi Arabia (Moore 1989).

Levels of nutrients, hydrocarbons, and heavy metals in WGNP have not been described in detail. Localized contamination of nutrients, hydrocarbons, and heavy metals is likely in harbors at Abu Ghusoon, Marsa Alam, and Hamata. Table 3 shows some of the parameter measured at different localities along the Red Sea Coast during July–August 1998.

Table 3 Oceanographic Parameters along the Red Sea Coast, 1998

Location	DO (mg/l)	S (%)	pH	Eh (mv)	Temp (°C)	TDS (g/l)	Spec (ms/am)
Hurghada	5.44	40.3	8.65	333	27.8	38.1	59.69
Safaga	4.3	39.79	8.55	433	27	36.45	57.3
Quseir	4.4	40.4	8.5	389	28.3	38.2	59.3
Marsa Alam	4.22	39.91	8.71	336	27.35	37.91	59.24

Source: Mansour *et al.* 2000

Geomorphology

The area can be divided into three major geomorphic units: the Red Sea high mountains, the coastal hilly area and lower mountains, and the coastal plain and the Red Sea coast. The coastal plain comprises several different morphotectonic features: rift shoulder, fault scarp, alluvial fans, *inselberg* (mountainous islands), piedmont plain, and raised beaches.

An elongated massive block of ultramafic rocks forms the highest mountains in the area, separating the watersheds of the Nile basin from that of the Red Sea basin. The coastal hilly area and the lower mountains form conspicuous topographical features between the coast and the main Red Sea hills. The isolated ranges and prolongation of the main igneous mass within the coastal plain helped in protecting the sedimentary rocks (especially gypsum deposits) by breaking the general erosion processes. The granitoid rocks are strongly weathered, forming low to moderate country. The gabbroic rocks are more resistant to weathering and form relatively higher hills.

The coastal plain has a low topography of a variable breadth, ranging from 0.6 km in the north (Wadi Ghadir) to more than 12 km in the south at Hamata. Numerous parallel wadis drain the rugged mountains and dissect the coastal plain. Sedimentary systems from the piedmont to the Red Sea coast comprise alluvial fans, wadis, and littoral (reef) terraces. In the modern era, a fringing coral reef (from 50–100 m wide) extends along the coast. Coral reefs are lacking at the mouths of some of the larger wadis as a result of

sediment (sand and pebbles) deposits during floods, hence marsas often occur at wadi mouths.

Coastal Topography

The coastline of the WGNP has a general north–south alignment. It is dominated by a well-developed coral reef that forms an almost continuous fringe along the coast. The reefs are occasionally broken by marsas and sharms, which are usually the outlets of wadis. Marsas and sharms are uncommon features in WGNP and support marine benthic assemblages that differ from those occurring on the more exposed areas.

Kotb *et al.* (2001) described six examples of fringing reef along the Egyptian Red Sea, all of which are found in WGNP. These include:

- ◆ Wide rocky reef flats (>100 m distance) and gently sloping reef face
- ◆ Narrow reef flats (<50 m) with deep lagoons with a distinct reef edge
- ◆ Very narrow reef flats without distinct reef edge
- ◆ Narrow reef flat without obvious reef edge
- ◆ Similar to above except with distinct reef edge and steep reef face

Moderately wide reef flat (100–200 m) and steep reef face.

There are five primary islands in WGNP. Wadi el-Gemal Island is located 5 km off Ras Baghdadi. Northeast of Hamata is the Qulan Archipelago, sometimes called the Hamata Islands. The Archipelago consists of four islands. They are, from north to south, Siyul, Shawareet, Um Ladid, and Mahabis Islands, in addition to a fifth small island off the Hamata mangrove that is periodically connected with the mainland at low tide. The islands range from 3–7 km off the mainland. These are low-lying islands with sandy beaches and raised fossil reefs consist of fossilized coral and carbonate rocks purportedly of Pleistocene origin. The entire region around the islands is a shallow water area with rugged bottom morphology. The island area is surrounded by well-developed fringing coral reefs consisting of shallow reefs bordered by a sloping sandy bed. Beyond the shallow reef-flats and intertidal areas, the reef slope drops away and is replaced by sand or sand with seagrass or sand with coral patches.

Inland Topography

The inland part of WGNP is composed essentially of high, rugged mountains, built up in a series of ranges, more or less coherently trending parallel to the coast, and interrupted by a number of detached masses and peaks. The highest peaks are concentrated in the southwest corner, where they rise to elevations up to 1,975 m (Gebel Hamata). The Nile basin–Red Sea watershed runs over the high peaks of the Red Sea Mountains, with an average elevation of 650 m. The moderate relief occurs in the southeast and northwest, surrounding the high mountainous zone.

The most important hills and mountains are: G. Hafafeet (1,341 m), G. Nugrus (1,505 m), G. Zabara (1,360 m), G. Ghadir (864 m), G. Sukari (630 m), G. Ghyweil (1,062 m),

G. Sikait (796 m), G. Sabahia (694 m), G. Lawi (615 m), G. Rada (556 m), G. Leweiwi (663 m), G. Um Kabu (644 m), G. Abu Hade (663 m), G. Khariga (927 m), G. Um Harba (718 m), G. Um Regeba (568 m), G. Um Maghar (851 m), G. Museraibe (1,021 m), G. Abu Etl (643 m), G. Um Sueh (748 m), G. Shawab (762 m), G. Kab el-Ahmer (604 m), G. Um Abbas (660 m), G. Mahali (612 m), G. Tarafawi (1,361 m), G. Sertote (1,368 m), G. Mureir (612 m), G. Sarobi (468 m), G. Hamata (1,975 m), G. Qulan (376 m), G. Um Leham (999 m), G. Khashir (1,562 m), G. Ras el-Khorate (1,658 m), G. Ejat (1,596 m), G. Mikibit (1,412 m), G. Zitit (898 m), G. Mukhatata (570 m), G. Abu Jurdi (1,096 m), G. Um Junud (880 m) and G. Um Mayat (976 m).

The area is dissected by a large number of wadis that begin in the mountainous terrain and run towards the Red Sea, following the general eastward slope. Slope gradient is mostly steep in the upper reaches of drainage systems and tends to be gentle to the east. The wadis are mostly oriented E–W, WNW–ENE, and NNW–NE (Ahmed, 2001). The main wadis are important as a network of tracks in the area and as the main arteries for underground water.

The main wadis of WGNP with their tributaries and branches from north to south are:

1. **Wadi Ghadir:** Wadi Ghuel, Wadi Fagas, Wadi Um Ud, Wadi Sabahia, Wadi Zabara (Wadi Atabi, Wadi Um Abid, Wadi Um Dafiri, Wadi Um Lasaf), and Wadi Allawi (Wadi Lewewi)
2. Wadi Khalilate el-Bahri
3. Wadi Khalilate el-Qibli
4. Wadi Sharm Fakeri
5. Wadi Araier: - Wadi Rimarim
6. **Wadi el-Gemal:** Wadi Hulous (Wadi Abiad el-Hulous, Wadi Mahali, Wadi Tarfawi, Wadi Um Semiuki, Wadi Marasan, Wadi Abu Gerifat, and Wadi Abu Etl), Wadi Um Suerab el-Gemal, Wadi Durunkat, Wadi Haffafit (Wadi Abu Had, Wadi Hafeifit), Wadi Nugrus (Wadi el-Nom, Wadi Abu Rasheid, Wadi Abu Sada, and Wadi Sikait), Wadi Mukhatatat, Wadi Um Sueh, Wadi Um Heran, Wadi Nasbia, Wadi Abiad (Wadi Um Seyal), Wadi Um Kabu, and Wadi Ghazal
7. **Wadi Um Abbas:** Wadi el-Anz
8. **Wadi Abu Ghsoon:** Wadi Dabaka, Wadi Abu Ghalga, Kab el-Ahmer, Wadi Shawab, Wadi Romit, Wadi Abu Ashush, Wadi Hakkara, and Wadi Dibag
9. Wadi Ranga, Wadi Sarobi, Wadi Dendikan, Wadi Rusas, Wadi Um Seiral, Wadi Hamata, Wadi Seleim, Wadi Hilefifi, and Wadi Masturra
10. Wadi Qulan, Wadi Saneiyat
11. Wadi Rada, Wadi Qulan El Atshan
12. Wadi Um Ramarim.

Geology

From the geological map of the region (EGSMA 1977 and CONOCO 1987) and findings during field investigations (Mansour 2003), the exposed basement rocks include, from oldest to youngest, the following mapable units:

1. Gneiss and migmatite
2. Metasediments
3. Metavolcanics
4. Serpentinities
5. Metagabbro diorite complex
6. Older granitoids
7. Hammamat group
8. Gabbros
9. Younger granitoids.

Dyke swarms of different types and colors are widely distributed in these rocks. Colored dykes in black metavolcanics form fascinating structures in some areas. The basement rocks are rich with geologic structures such as faults and folds. These structures are fascinating even for the layperson. Shear zones are the most important structural features in the area. They open out to the north to form a flower structure. El Ramly *et al.* (1993) made a structural map of the Hafafeet area and recorded 11 phases of deformations. Faults of Cretaceous age in the area trend along a NW–SE axis. The minor folding in this area is complex, varying from recumbent to upright.

The Neogene and Quaternary sediments occupy the eastern flank of the basement rocks. From Wadi Ghadir to Wadi el-Gemal, the piedmont gives good examples of the relative positions of sedimentary formations along the coast where the Precambrian basement, faulted by tectonic and possibly Aqaba-oriented faults locally comes within a few kilometers or less from the Red Sea. Above the basement, Miocene evaporates and Pliocene continental and marine beds forming a belt of coastal hills overlie transgressive Miocene dolomites. In the wadis, late Pliocene to recent sediments include clastic and marine deposits can be found. In the area between Wadi el-Gemal and Wadi Ranga, the Abu Ghusoon formation overlies basement rocks and underlies the Ranga Formation. Subsequent faulting caused relative lowering of sea level and the Abu Dabbab evaporates at the foot of the main middle Miocene carbonates of the Um Mahra formation. Uplift of the rift periphery led to the deposition of Pliocene sediments in areas nearer to the present Red Sea. In the area between Wadi Ranga and Wadi Rada, a relatively narrow coastal plain lies between the basement range and the Red Sea coast. Lower Miocene (Ranga Formation) stratum crops out immediately to the east of the basement range. This unit is overlain by carbonates of the Um Mahara formation which, in turn are bounded to the east by the Miocene Abu Dabbab evaporates belt to the south of Wadi Rada. Down to Wadi Lahmi, a relatively wide (12 km) tectonic depression forms a relatively deep embayment in the basement, bounded by N 120–140 and N 50–60 fault.

Upper Miocene siliciclastics were deposited at the foot of the basement rock. In the east, a dominantly carbonate formation (Shagra Formation) represents the latest marine Pliocene sediments. Pleistocene siliciclastics (Samadi Formation) constitute most of the outcrops within the aforementioned structural embayment, where they extend southwards to Wadi Um Ghazal.

Alluvial fans of different widths (N–S) and length (E–W) are represented by several terrace steps, sometimes occurring as single features flanking the sides of the wadis but on occasions arranged in the vertical successions forming flights along the sides of the present wadi channels. These fans are composed mainly of sand and gravel.

Geometrically, the modern extension of coastal plain is very similar to its Pleistocene counterpart. A few facies similar to the older Pleistocene facies are almost restricted to extreme shallow water defined by their dominant biota, morphology, and sediment type. As elsewhere along the Red Sea, the fringing reef is the seaward extension of the coastal plain.

Structural analysis of the basement complex in the area reveals four main deformation phases made the tectonic framework of the area (Abdel Aziz, 1999). The oldest phase was represented by NW-trending folds and NE-dipping low-angle thrust faults. The folds are upright, gentle synclines and anticlines of varying dimensions plunging gently in a SE direction. The folds and the thrusts were formed by compressive stress acting from the NE. The pattern of orientation of the quartz c-axes within the foliation indicates orthorhombic symmetry.

The second phase is represented by NW–SE left lateral strike-slip faults, which may belong to the so-called Najd Fault System. The paleostress analysis of these faults using slip lineations data indicates that they had been formed by a horizontal triaxial compressive stress acting from ESE–WNW direction. Strain analysis of stretched pebbles collected from shear zones belonging to this trend has revealed that most of the analyzed pebbles are of oblate and prolate types. The maximum stretching direction of the pebbles is the NW–SE. The crystallographic preferred orientation of the quartz c-axes confirmed the left lateral sense of the faults.

The third phase of deformation is represented by E–W left lateral strike-slip faults with small vertical component. The paleostress analysis using the slip lineations data indicates that the faults were formed by a plunging compressive stress acting in an ENE–WSW direction. Fry analysis of deformed grains indicates that the strain ellipse is oriented in the E–W direction.

The fourth phase of deformation is represented by NNW–SSE right lateral strike-slip faults. The paleostress analysis using the slip lineation data indicates that the faults were formed by a horizontal compressive stress acting in NNE–SSW direction.

Drainage Basins

Along the Red Sea coast, flash floods represent a rare natural but ecologically important phenomenon. The area is occasionally subjected to heavy showers during winter, followed by torrential floods that may cause disastrous damage to roads and misplaced structures. According to climatic parameters, the area receives an average rainfall quantity estimated at 98.75 million m³/year (Table 4). Twenty-three drainage basins with outlets on the Red Sea were defined in the area between Marsa Alam and Ras Banas (Table 2, Mansour 2003). They range between small (11.52 km²) and large (1,476.7 km²), with a drainage density between 1.4–3.8. The drainage network is well developed, integrated, and fairly dense, but is not consistent all over the area. Wadi Ghadir and Wadi Rada have high values of relief and ruggedness, and this concentrates runoff. Therefore, the probability of flooding is very high. Wadi el-Gemal has the highest value of maximum runoff, followed by Wadi Lahmi and Wadi Ghadir. This explains the good vegetative cover of these drainage basins. In contrast, the basins of Wadi Ranga and Wadi Um El Abas can be classified as less prosperous basins.

Ground Water

In the deserts of Egypt, the surface water resources are generally very limited; therefore, ground water resources constitute a cornerstone for the livelihood of local people and many biotic elements. The ground water resources in the Eastern Desert originate mainly from occasional rainfall that partially infiltrates through the friable sediments and accumulates in basement depressions or is trapped by faults and buried dykes. Table 4 shows estimates of rainfall and runoff in some of the main basins near WGNP.

Table 4 Rainfall and Runoff Estimates in Basins near Wadi el-Gemal

Basin Name	Area (km ²)	Annual Rainfall (106 m ³ /year)	Max. Rainfall in One Day (10 m ³)	Max. Runoff in One Day (10 m ³)	Min. Runoff in One Day (10 m ³)
Wadi Samadai	63.26	1.1	4.05	2.66	0.24
Wadi Um Tundebe	67.07	1.17	4.29	2.82	0.25
Wadi Ambaut	90.47	1.57	5.79	3.8	0.34
Wadi Nakari	48.34	0.84	3.09	2.03	0.18
Wadi Ghadir	554.24	9.64	35.47	23.28	2.08
W. Khalilat el-Bahri	13.28	0.23	0.85	0.56	0.05
Wadi Khalilate el-Qibli	11.52	0.2	0.74	0.48	0.04
Wadi Sharm Fakeri	73.05	1.27	4.68	3.07	0.27
Wadi Araier	261.32	4.55	16.72	10.98	0.98
Wadi el-Gemal	1476.7	25.7	94.51	62.02	5.54
Wadi Um Abas	337.97	5.9	21.63	14.19	1.27
Wadi Abu Ghusoon	495.29	8.62	31.7	20.8	1.86
Wadi Ranga	309.63	5.39	19.82	13	1.16
Wadi Qulan	57.33	1	3.67	2.41	0.21

Basin Name	Area (km ²)	Annual Rainfall (106 m ³ /year)	Max. Rainfall in One Day (10 m ³)	Max. Runoff in One Day (10 m ³)	Min. Runoff in One Day (10 m ³)
Wadi Rada	156.77	2.73	10.03	6.58	0.59
Wadi Um Ramarim	48.83	0.85	3.13	2.05	0.18
Wadi Khashir	464.01	8.07	29.7	19.49	1.74
Wadi Lahmi	967.08	16.83	61.89	40.62	3.63
Wadi Um Ghazal	16.42	0.29	1.05	0.69	0.06
Wadi Qurat el-Hartwai	37.21	0.65	2.38	1.56	0.14
Wadi Staiya	39.06	0.68	2.5	1.64	0.15
Wadi Sharm el-Luli	60.15	1.08	3.85	2.53	0.023
Wadi Um Dahise	24.12	0.42	1.54	1.01	0.09
Total		98.78	363.08	238.27	21.073

Source: Mansour 2003

In WGPNP, investigations of ground water quality have been carried out by Ahmed (2001) in three main wells in Wadi el-Gemal basin (Bir Wadi el-Gemal 24°30'14"N 34°42'34"E, Bir Um Ghanam and Bir Hafafeet 24°30'00"N 34°49'00"E). The average salinity of groundwater varies from one year to another as well as from one season to another. Salinity ranged between 490 parts per million (ppm) (Bir Um Ghanam) and 3,185 ppm (Bir Hafafeet) in August 2000 (Table 3). The minimum salinity that was recorded in Bir Um Ghanam (490 ppm) is due to the location of the well close to the recharge areas (Ahmed, 2001). This situation accelerates the direct infiltration of rainwater into the opened fractures where it comes out as springs. The average salinity of Bir Wadi el-Gemal is 960 ppm. In Bir Hafafeet, the evaporation process causes a considerable increase in water salinity (3,185 ppm). Moreover, the water of the area is slightly alkaline where the measure of acidity or alkalinity (pH value) ranges from 7.38 (Bir Wadi el-Gemal) to 7.83 (Bir Um Ghanam). Table 5 shows the results from chemical analysis of the groundwater in the Wadi el-Gemal Basin in August 2000.

Table 5 Chemical Analysis of Groundwater in the Wadi el-Gemal Basin, 2000

Parameters		Bir Um Ghanam	Bir Wadi el-Gemal	Bir Hafafeet
TDS		490	960	3185
PH		7.83	7.38	7.40
Cations	Ca ⁺²	66.40	91.20	103.20
	Mg ⁺²	13.60	27.35	78.10
Anions	HCO ₃ ⁻	106	62	228
	Cl ⁻	62	68	784
	SO ₄ ⁻²	130	180	125
Total Hardness		222	340	578
Turbidity		7	—	—
Trace metals	Fe ⁺²	0.06	0.05	0.01

Parameters		Bir Um Ghanam	Bir Wadi el-Gemal	Bir Hafafeet
	Mn ²⁺	0.10	0.00	0.03
	Cu ²⁺	0.00	0.60	0.75

Source: Ahmed 2001

Dissolved solids and total hardness of the collected water samples from Bir Um Ghanam and Bir Wadi el-Gemal are mostly below the World Health Organization's (WHO) 1984 maximum permissible limits for drinking water and therefore, can be used safely for drinking purposes after microbiological treatment. The total dissolved solids and total hardness of the water samples of Bir Hafafeet were higher than the WHO's maximum permissible limits for drinking water; therefore, the water cannot be used for drinking purposes.

Biodiversity Resources

Marine Habitats

In this Plan, marine habitats are broadly defined according to their dominant biota, physical environmental influences, and/or substratum type. Given the lack of accurate quantitative mapping of marine biota in the PA, it was deemed unnecessary, at this stage, to attempt a more detailed classification scheme.¹ However, preliminary observations indicate that there are seven broadly defined marine habitats in the PA.

- ◆ Coral reefs
- ◆ Seagrass meadows
- ◆ Pelagic
- ◆ Subtidal sand
- ◆ Intertidal sand
- ◆ Intertidal pavement with algae.

These habitats and their characteristic biota are described below. For many habitats, only a broad overview could be given because of the lack of scientific investigations in the PA.

CORAL REEFS

Coral reefs are perhaps WGNP's most distinct and sensitive habitat, by far supporting the greatest biodiversity in the PA. The Red Sea has some of the most attractive, intact, well-developed, and biologically diverse coral assemblages in the world. Riegel & Luke (1997a) described at least 11 coral assemblage types from the Egyptian Red Sea and defined them by the dominant coral genus or genera, exposure (windward/leeward) and

¹ At the time of preparing this report, the GIS Section of the EEAA/PSU only had access to Landsat imagery with a pixel resolution of between 15 × 15 m for the pancromatic imagery and 30 × 30 m for the multispectral imagery. Both have limited water depth penetration. This made it impossible to delineate among most habitats, even at a coarse scale.

topography. In the PA, four assemblage types are widespread: windward *Acropora* assemblage, *Acropora* dominated patch reef assemblage, the leeward *Porites* assemblage, and *Millepora* current assemblage.

♦ **Windward *Acropora***

Assemblage—This assemblage is found on windward or exposed reef edges and slopes. On the reef edge, *Acropora gemmifera* is the dominant coral. This species, with a sturdy growth form, is able to tolerate areas exposed to surge and extreme seawater temperatures. The reef slope is typically high in coral cover, and is dominated by the genus *Acropora*.



WGNP has some of the best preserved coral reefs in the Red Sea.

- ♦ ***Acropora*-dominated Patch Reef Assemblage**—*Acropora* also dominates this assemblage type, but *faviids* may also be abundant. Restricted to ‘exposed well washed areas’ (Riegel & Luke 1997a).
- ♦ **Leeward *Porites* Assemblage**—As implied by its title, this assemblage is typically found on the leeward side of reefs. It is dominated by large *Porites* colonies, commonly *Porites lutea*. The genera *Pavona*, *Hydnophora*, and *Favia* may characterize the reef edge.
- ♦ ***Millepora* Current Assemblage**—This assemblage is dominated by *Millepora dichotoma*, and is typically exposed to strong currents but not significant wave action.

SEAGRASS MEADOWS

Seagrass meadows are amongst the most distinct habitats of WGNP, supporting similarly distinct communities of benthic fauna and fishes. Seagrasses are important food items for globally threatened dugongs *Dugong dugon* and Green Turtles *Chelonia mydas*. However, little research has been done on the seagrasses of WGNP. Five sites sampled in the PA during the Global Environment Facility (GEF) project contained seagrass. Percent cover of seagrass varied significantly among sites, as well as within sites.

Seven species of seagrasses have been recorded in WGNP (see account under species). Near Wadi el-Gemal, six species of seagrasses were observed within the small marsa adjacent to the Shams Alam Diving Centre. The most widespread species appears to be *Halophila stipulacea*, which forms extensive mono-specific meadows in waters between 6 and, at least, 45 m (see Map 4). Species of seagrass consumed by dugongs in the Red Sea are: *Halophila stipulacea*, *Halodule uninervis*, *Thalassodendron ciliatum*, *Cymodocea rotundata*, and *Syringodium isoetifolium* (Lipkin 1975).

PELAGIC

This habitat includes the water column and ranges in depth from the surface to depths exceeding 1,000 m near the PA's eastern boundary. Weikert (1982) classified the central Red Sea water column into three zones based on zooplankton activity: epipelagic (0–100 m), mesopelagic (100–750 m), and bathypelagic (>750 m). It remains unclear whether these zones can be extrapolated to waters of the PA because no studies have been done to describe the composition and abundance of plankton found in deep waters off the PA.

SUBTIDAL SAND

Subtidal sand is one of the largest habitats in terms of spatial extent. Like intertidal sand, it supports numerous species of invertebrates that live on or beneath the sediments. These organisms are described in following sections. This habitat can be subdivided into shelf and slope sands, but no studies have been done to characterize the subtidal sediment fauna of this region of Egypt, or how their abundance and distribution is influenced by water depth and its correlates.

INTERTIDAL SAND

Intertidal sand relates to soft sediments that are periodically exposed to air at low tide. The area of intertidal sand is small in the PA and is typically restricted to sheltered areas along the mainland coast or on the leeward side of island fringing reefs where sediments can accumulate. According to Jones *et al.* (1987) sediment in this habitat is usually poorly sorted due to the low tidal amplitude and the protection received from fringing reefs due to wave action. Jones also provides a detailed summary of the organisms of this habitat.

INTERTIDAL PAVEMENT WITH ALGAE

Intertidal pavement is a common habitat fringing the offshore islands and mainland coast. The dominant biota is algae, the most conspicuous being the browns *Turbinaria*, *Padina* and *Sargassum* and greens, such as *Halimeda*. Red algae (*Rhodophyta*) may also be common in some areas. These marine plants play an important role in the functioning of marine ecosystems. Firstly, they are important primary producers. Secondly, some genera, such as *Halimeda*, contribute vast quantities of calcareous disks to the seafloor. Thirdly, coralline algae cement and consolidate the reef framework, and may provide important settlement locations for larvae of some marine organisms.

About 500 species of benthic algae are known from the Red Sea. Razek *et al.* (1998a, 1998b) described macro-algae living near mangrove stands in the PA. They found few species per site (typically fewer than 10) and reported red algae to be the most abundant macro-algae.

Littoral Habitats

MANGROVE STANDS

Four species of mangroves have been reported from the Red Sea. Two species, *Avicennia marina* and *Rhizophora mucronata*, are known only in Egypt. *Avicennia marina* is the more

common. There are 28 mangrove stands distributed along the Red Sea (Saenger 2002).² Razeq *et al.* (1998a, 1998b) described in detail a small number of mangrove stands along the Red Sea, while Saenger (2002) gave a more general description of the 28 mangrove stands known or documented in Egypt.



Well-developed mangrove stand at Hamata, WGNP

Only *Avicennia marina* is found in WGNP; however the PA supports a significant proportion of the mangrove resources of Egypt. Nine mangrove stands, as shown in Table 6 and numerous isolated individual trees have been recorded in the PA (Map 2). Included in this list is a stand of dwarf mangroves recently discovered in a location 1 km north of the Shams Alam Resort (Wadi Araeir). In addition, two stands are located on offshore islands.

Table 6 Mangrove Stands in WGNP

Location Name	Geographic Position
Wadi Araeir	24°42'N 35°05'E
Wadi el-Gemal Delta	24°40'N 35°05'E
Wadi el-Gemal Island	24°40'N 35°10'E
Ras Baghdadi	24°39'N 35°06'E
Sharm el-Luli	24°36'N 35°07'E
Hamata Mangroves	24°18'N 35°22'E – 24°24'N 35°15'E
Shawareet Island	24°21'N 35°24'E
Wadi Lahmi	24°13'N 35°26'E
Qurat el-Hartway	24°06'N 35°29'E

Saenger (2002) observed that mangroves in Egypt are typically associated with coral fringing reefs that provide protection from wind and waves. He suggested that populations of *Avicennia marina* on the Red Sea coast contain important genetic diversity not available in other populations of this species.

² The Hamata mangroves are counted as one stand, although they form a discontinuous fringe along 12 km of coastline.

LITTORAL SALT MARSH

The salt marsh vegetation is dominated by *Tamarix nilotica*, *Zygophyllum album*, *Aeluropus sp.*, *Sueda monoica*, and *Nitraria retusa*.

FRESH WATER SWAMP

The Wadi el-Gemal delta contains the only known natural fresh water swamps on the Red Sea coast in Egypt. Although occupying a very small area, the swamp is important as a relict habitat, which supports typical flora (*Phragmites*, *Cyperus*, and some *Hydrophytes*) and fauna. Some highly localized forms could be found, but this needs further verification.

ISLANDS

There are four marine islands included in the PA (Wadi el-Gemal Island, and three islands in the Hamata group), in addition to two very small sandy islands, which are said to become inundated occasionally and one island which is tenuously attached to the mainland (in the Hamata area).

Marine islands offer an important habitat for many organisms. Seabirds and marine turtles (see details below) intensively use these islands for nesting, due to the lack of predators. Biogeographically, each of the islands represents a unique natural evolutionary experiment that has evolved over millennia and could provide important insights into the ecological past of the region.

Urgent, effective management of these islands should be a priority for future conservation efforts in the region.

Terrestrial Habitats

COASTAL DESERT

The desert bordering the Red Sea is very dry, and vegetation is largely restricted to the mouths of larger wadis that carry occasional flash floods from the Eastern Desert mountains to the sea. Here the vegetation is typically characterized by dense growth of *Tamarix nilotica* associated with *Zygophyllum album*, *Z. coccineum*, and occasionally scattered *Acacia tortilis*. Examples of this vegetation assemblage in the PA are found at the mouth of Wadi Umm el-Abas, Wadi Sharm el-Luli, and Wadi Abu Ghusson.

The coastal desert also enjoys localized higher humidity than the interior of the Eastern Desert, which sometimes forms dew. This meager input allows a scant plant cover of vegetation to exist in a very narrow band along the Red Sea coast, concentrated mainly in small runnels and shallow sandy depressions.

GRAVEL AND SANDY PLAINS

This is the least productive of the region's habitats. Vegetation is scant and largely confined to depressions and runnels where sufficient rainwater accumulates. Some large plains fringe the coastal mountains, where vegetation is composed primarily of *Zygophyllum coccinum* and *Lemonium sp.* Further inland in the upstream portion of Wadi el-

Gemal sandy plains are found dotted with large granite outcrops, the vegetation here is dominated by the grasses *Panicum turgidum* and *Stipagrostis plumose*.

WADIS



Wadi el-Gemal is the most important of the wadis in WGNP and the best vegetated

The desert in this section of the Eastern Desert is made up of a maze of complex wadi systems and hills. Wadis are the most characteristic feature of the

landscape of much of the Eastern Desert,

and the most important ecologically. Wadis are the drainage system of desert mountain systems, formed over millennia, concentrating meager precipitation into limited areas, allowing vegetation and other life to get a foothold in a patchy fashion in an otherwise inhospitable desert. Wadis start near the summits of mountains as numerous shallow precipitous runnels dissecting the slopes. At lower elevations, the runnels coalesce into larger well-defined channels, the beds of which are often covered with large rocks. Near the foothills, the wadis are wide with a sandy or silty bed. Here the densest vegetation is usually to be found, depending on the size of the area that the wadi drains and the average precipitation that falls in the area.

The fact that Wadi el-Gemal is one of the best-vegetated wadis in the Eastern Desert can be explained by its extensive watershed, including two of the highest mountains in that region (Gebels Hamata and Nugrus). The relative abundance and regularity of flooding in the Wadi el-Gemal drainage system has allowed the development and retention of well-stratified vegetation communities, probably representing a relict representation of environments, which were more widespread throughout the Eastern Desert during past fluvial episodes. This illustrates the significance of the conservation of the Wadi el-Gemal system in its entirety.

The plant communities of Wadi el-Gemal include several well-developed and stratified assemblages (Prof. Mohamed Kassas pers. com. May 2002). At the wadi delta, Mangroves *Avicennia marina* grow on the coastline, followed by a salt marsh belt with several halophytes, *Aeluropus sp.*, *Nitraria retusa*, and *Tamarix nilotica* bushes. In the first segment of the wadi, dense *Tamarix nilotica* bushes grow on silty and sandy soils, with scattered *Acacia tortilis* trees on the gravelly banks of the wadi. Further upstream, *Tamarix aphylla* co-dominates with *T. nilotica* forming dense thickets intermixed with scattered

individual *Balanites aegyptiaca*, *Acacia tortilis*, and *Salvadora persica*. In the middle portions of the wadi, dense growth of *Balanites aegyptiaca* is found (one of the largest strongholds of the species in Egypt) intermixed with *Acacia tortilis*. The characteristic plant community of the upper section of the wadis is dominated by *Acacia tortilis* and *Zilla spinosa*.

The density of the *Balanites aegyptiaca* trees in certain parts of Wadi el-Gemal in particular, but also in other neighboring wadis is striking; it is by far the dominant species and sometimes forms a forest-like growth. The tree is valuable; its fruits are used medicinally (for control of diabetes) and are collected by the local population and sold as a cash crop, the branches are palatable and grazed by camels, and the wood is collected as fuel.

At the eastern end of the main stream of Wadi el-Gemal, beginning approximately 5 km from the shoreline, large stands of *Salvadora persica* are present. Similar huge stands are present in Wadi Allaqi and Nabq PAs. Smaller populations of *Salvadora persica* were also encountered in other wadis, sometimes in association with Acacia trees, e.g. Wadi Halous.

MOUNTAINS

The terrestrial portion of WGNP is predominantly mountainous, being situated on the eastern flank of the spine of basement mountains that extended along the Red Sea. It encompasses fairly high mountains reaching up to 1,975 m at Gebel Hamata (the second highest in the Eastern Desert) and 1,505 m at Gebel Nugrus.

Mountains usually receive considerably more precipitation than the surrounding desert, often allowing comparatively more life to exist in a unique but restricted habitat. For this reason, desert mountain habitats are of particular interest, since they usually support unique faunal and floral elements.

The mountain effects are typically observed on higher mountains (higher than 1,000 m), such as Gebel Hamata, which enjoys the greatest precipitation in the region. Gebel Hamata has been likened to Gebel Elba in its ability to condense orographic precipitation from prevailing northerly winds (Kassas 1993). This is due to its considerable height and proximity to the sea. Vegetation on Gebel Hamata is also comparable (to some extent) to that on Gebel Elba (Kassas 1993).

Species

Flora

SEAGRASSES AND ALGAE

Seagrasses are flowering plants able to live permanently in the marine environment and are represented by about 50 species within 12 genera. Eleven species of seagrass are known from the Red Sea (Sheppard *et al.* 1992). Many species are widespread, but *Halophila decipiens* has only been recorded in the Gulf of Suez and *H. ovata* from Jeddah, Saudi Arabia (Jones *et al.* 1987). Most species are restricted to unconsolidated soft

bottom areas that are shallower than 10 m. However, *Halophila stipulacea* and *Thalassodendron ciliatum* have been found in waters deeper than 40 m.

Seven species of seagrass have been recorded in the WGNP, as shown in Table 7. *Halophila stipulacea* and *Thalassia hemprichii* were reported to form scattered beds in the PA. In the Hamata Archipelago, *Holdule uninervis* and *Halophila stipulacea* form mixed beds on the leeward side on some islands (T. Rouphael, pers. com. July 2002).

Table 7 Seagrass Species Reported in the WGNP

<i>Thalassia hemprichii</i>	<i>Halophila stipulacea</i>
<i>Thalassodendron ciliatum</i>	<i>Halophila ovalis</i>
<i>Halodule uninervis</i>	<i>Syringodium isoetifolium</i>
<i>Cymodocea rotundata</i>	

At least 58 species of marine algae can be found in the PA (GEF 1997).

TERRESTRIAL FLORA

Floristically, Kassas (1993) classified the Wadi el-Gemal–Hamata area as a part of the “Southern (Nubian) Section” of the Eastern Desert. Barakat (2003) reported that the flora of WGNP comprises 73 plant species, of which 53 are perennials and 21 are ephemerals. The terrestrial plant species found in WGNP are listed in Appendix 5.

Zahran & Willis (1992) and Barakat (2003) recognized nine floral communities in WGNP (Map 3).

Mangrove Community—Climatic conditions and shoreline morphology in the coastal part of the PA allow the presence of mangrove trees, which are confined to small sheltered bays cut into the beach where the characteristic *Avicennia marina* form monotypic bushy forests. *Avicennia marina* is one of the 55 species of mangrove growing in tropical and subtropical coastal areas. Another species, *Rhizophora mucronata*, grows on the Red Sea coast further south.

Salt Marsh Community—Distinct zones are evident within the coastal plant communities corresponding to their levels of salinity tolerance. The salt marsh communities often fringe Mangroves on the coast and their inland extension depends on the raised land further west. The plant cover is formed of stands of uniform growth of a single dominant species and a few associates, mainly halophytes. Thus a mosaic of the



Capparis sp. one of the characteristic plants of mountain habitats in WGNP

following species is often recorded and varies according to local topography and soil salinity: *Arthrocnemum/Salicornia*, *Atriplex halimus*, *Atriplex farinosa*, and *Zygophyllum album*.

Coastal Dunes Community—Further from the shoreline, distinctive vegetation can be observed growing on sand dunes, forming phytogenic mounds or hillocks. *Tamarix* mounds are perhaps the most prominent among these but there are several other species growing within this type of ecosystem such as *Aeluropus brevifolius*, *Limonium axillare*, *Stipagrostis sp.*, *Zygophyllum album*, *Zygophyllum coccineum*, *Tamarix aphylla*, and *Tamarix nilotica*.

Reed Swamp Community—Reed swamps are present where there is seepage of fresh or brackish water onto the surface. The large swamp at the mouth of Wadi el-Gemal (the Wadi el-Gemal delta) holds the only example of a reed swamp throughout much of the Egyptian Red Sea. This special condition has led to the development of a peculiar floristic assemblage, characterized by the presence of reeds but also some halophytes in addition to palms. The swampy areas are dominated by reeds: *Phragmites communis*, *Cyperus sp.*, and *Scirpus sp.* The Wadi el-Gemal delta also harbors other species, the most notable of which are: *Avicennia marina*, *Tamarix aphylla*, *Tamarix nilotica*, *Zygophyllum album*, *Zygophyllum coccineum*, *Limonium axillare*, *Hyphaene thebaica* (Dom palm), and *Phoenix dactylifera* (Date palm).

Coastal Plain Community—This extends from littoral area to the foot of the coastal mountains and is characterized by semi-halophytic *Limonium axillare* and *Zygophyllum coccineum*, as well as small thickets of *Tamarix aphylla*, *T. nilotica*, and *Salvadora persica* and the smaller herbaceous *Zilla spinosa* and *Pulicaria crispa*.

Downstream Vegetation Community—The littoral downstream of wadis supports vegetation in the intermediate area between the coastal desert plain and main wadi vegetation and varies according to geomorphology and soil characteristics. The eastern part, closer to the coast and where the soil is sandy and saline, usually supports halophytic to xerophytic species with *Zygophyllum album*, *Z. coccineum*, *Z. berenicense*, *Tamarix aphylla*, and *Tamarix nilotica*.

Wadi Vegetation Community—The main trunk of the wadis is dominated by *Acacia tortilis* and *Balanites aegyptiaca* (as in Wadi el-Gemal). Associates are *Acacia ebrenbergiana* (which sometimes replaces *A. tortilis*), *Panicum turgidum*, *Leptadenia pyrotechnica*, *Lycium shawii*, *Aerva javanica*, *Solenostemma argel*, *Citrullus colocynthis*, and *Ochradenus baccatus*. Chasmophytes such as *Capparis decidua* and *C. spinosa* grow in rock crevices along the wadi sides (but also in upstream of wadis such as in Wadi Um Lassaf). *Maerua crassifolia* tree was a rare find, associated with *Acacia ebrenbergiana*, *Panicum turgidum*, *Cleome droserifolia*, and *Trichodesma africana* var. *homotrichum* as in upstream of Wadi Halous.

Other plants recorded in the main stream of various wadis within the PA include: *Caylusea sp.*, *Chrozophora oblique*, *Citrullus colocynthis*, *Cleome africana*, *Erodium sp.*, *Fagonia sp.*, *Heliotropium strigosum*, *Launaea spinosa*, *Linaria arabica*, *Lindenbergia abyssinica*, *Lotus deserti*, *Pulicaria crispa*, *Senna alexandrina*, *Tephrosia cf. nubica*,

Trichodesma africana var. *homotrichum*, *Zilla spinosa*, *Zygophyllum berenicense*, and *Zygophyllum coccineum*.

Plateau Community—The distinct vegetation community inhabiting the extensive inland sandy plateau in upper Wadi el-Gemal is dominated by the perennial palatable grass *Panicum turgidum*, in association with *Zilla spinosa* and *Pulicaria crispa*. Also present are: *Stipagrostis* sp., *Erodium* sp., *Heliotropium* cf. *strigosum*, *Senna alexandrina*, *Cleome africana*, *Ochradenus baccatus*, and *Acacia tortilis*.

Montane Community—This community inhabits mountains facing the Red Sea and reaching above 900 m. It is characterized by *Moringa peregrina*, *Ficus palmata*, *Lindenbergia abyssinica*, and *Kickxia nubica*. Several rare species are recorded here, including *Acacia mellifera*, *Rhus oxycantha*, *Ficus salicifolia*, and *Adiantum capillus veneris*.

Fauna

CORAL

The clear, warm waters of the Red Sea support some of the most attractive and biologically diverse coral reefs in the world. About 300 species of scleractinian corals are recorded from the Red Sea, with more than 250 species, from 58 genera, reported in the central-northern Red Sea (DeVantier *et al.* 2000). Two hundred and five species of scleractinian coral are known from South Sinai (Reigl & Luke 1997a) and 132 species of hard and soft corals have been recorded from Egypt's Red Sea coastline between Gemsa and Shalatein (Kotb *et al.* 2001). About 86 species of corals are currently known from the PA (GEF 1997). Further surveys will undoubtedly increase these numbers.



Fringing Reef at Sharm el-Luli, WGNP

In WGNP the percent cover of coral is highly variable, even over short distances (<10m) (T. Roupheal, pers. com. June 2002). Kotb *et al.* (2001) sampled 12 sites of mainland fringing reefs in the PA and found that the number of hard coral species varied from 0 to >50 (Map 4). *Stylophora* is the dominant genus on the reef flat and *Porites* and *Montipora* the dominant genera in deeper water (GEF 1997). Areas of high coral abundance include the reef face near Abu Ghosoon and opposite the fishing village at Wadi Abu Ghosoon.

Eighty-six species of coral have been recorded between Wadi el-Gemal and Hamata, making it one of the most diverse regions in the Egyptian Red Sea (GEF 1997). However, like coral cover, the number of species per site varies significantly.

OTHER MARINE INVERTEBRATES

Tropical marine and coastal habitats support numerous species of sponges, jellyfish, crustaceans, mollusks, bryozoans, and echinoderms. More than 2,441 species of mollusks, crustaceans, and echinoderms, representing 279 families have been recorded from the Red Sea (JICA 2000). Some of these organisms, such as holothurians, play a critical role in nutrient recycling (Uthicke 2001), while others, such as sea urchins, can influence the distribution of marine habitats.

The reefs of the PA support high densities of framework cavities that are likely to sustain an abundance of cavity-dwelling (coelobite) filter feeders. Richter *et al.* (2001) suggested that reef coelobites are important in the trophodynamics of coral reefs.

ZOO/PHYTOPLANKTON

Sheppard *et al.* (1992) provides a comprehensive, albeit dated, review of the plankton of the Red Sea. Razek *et al.* (1998a, 1998b) gives a more recent description of the spatial distribution and community composition of phytoplankton adjacent to mangrove stands in the PA. They found that phytoplankton was composed mainly of benthic diatoms. In contrast, Beltagi (1997) reported that water column phytoplankton of the northern Red Sea was mainly represented by coccolithophorids and dinoflagellates.

Khalil & El Rahman (1997) recorded 62 species of zooplankton from surface waters off the South Sinai coast. Copepods were the numerically most abundant taxa, followed by meroplanktonic larvae. They noted that zooplankton abundance, in terms of number of individuals, peaked in winter.

TERRESTRIAL INVERTEBRATES

Not much is known about the terrestrial invertebrates of the region; however it is generally characteristic of that of the Eastern Desert.

FISHES

The Red Sea fish fauna has been extensively reviewed by Ormond *et al.* (1984), Ormond & Edwards (1987) and Sheppard *et al.* (1992). About 1,000 species are known from the Red Sea (Sheppard *et al.* 1992). Allen (in press) identified the Red Sea as the fourth most important global coral-reef fish hotspot in terms of the percentage of endemic species. His estimate was based on 900 species from the most speciose families, of which 114 species (12.7 percent) are endemic to the Red Sea.

Two hundred and sixty-one species of inshore fishes, representing 89 genera, have been observed between Gemsa and Shalateen; of these 104 were found in the PA (GEF 1997).

REPTILES

Reptiles constitute the most prominent component of the local terrestrial fauna. There are at least 25 terrestrial reptiles inhabiting the Wadi el-Gemal–Hamata area (Marx 1968, Baha El Din 2003) (listed in Appendix 11). The characteristic reptiles of the region include the lizards *Acanthodactylus boskianus* and *Mesalina guttulata*, the geckos *Tropiocolotes steudneri*, *Pristurus flavipunctatus*, and *Ptyodactylus hasselquistii*, the agamids *Agama spinosa* and *Uromastyx ocellata*, and the snakes *Cerastes cerastes* and *Psammophis aegyptius*. Most of these species are fairly common and are observed regularly (see Map 5).

The species with the greatest conservation concern is the Ocellated Dab Lizard *Uromastyx ocellata*, which is targeted by professional animal collectors, who illegally collect and export large numbers of the species every year for the international pet trade.

MARINE TURTLES

Five species of marine turtles have been recorded from the Red Sea: hawksbill *Eretmochelys imbricata*, green *Chelonia mydas*, olive ridley *Lepidochelys olivacea*, loggerhead *Caretta caretta*, and leathery turtle *Dermochelys coriacea*. Two species, *E. imbricata* and *C. mydas*, are known to nest in the Red Sea (Map 6).

In WGNP, green turtles are reported to nest on the mainland at Umm el-Abas and Ras Baghdadi, and on Wadi el-Gemal Island and Siyul Island, in the Qulan Archipelago (Frazier & Salas 1984, Salam 2001, Abd el-Ghani 2002). M. Hanfay, PSU Hurghada, (pers. comm. April 2003) also recorded five old nests approximately 1 km north of Shams Alam Resort. According to Ali Salam, EEAA Hurghada (pers. comm.), green turtles nest in Egypt from May to November. The distribution of hawksbill nesting locations in the PA is less clear. S. Baha El Din, PSU Hurghada (pers. comm.), found nests of this species on Wadi el-Gemal Island in June 2002, and A. Salam, EEAA Hurghada (pers. comm. March 2003), mentioned that a small number nest on Ras Baghdadi. Frazier *et al.* (1987) reported that hawksbill nested from April to July in Egypt.

BIRDS

The resident avifauna of WGNP is composed of some 45 species. A much larger diversity of species visits the area as migrants and winter visitors; however, the breeding and resident species can be considered a permanent and integral component of the local ecosystem (Goodman & Meininger 1989, Baha El Din 1999, Baha El Din 2003) (see list in Appendix 12).

Water and Sea Birds—There are 13 water and sea bird species associated with and largely confined to the marine



Lichtenstien's Sandgrouse *Pterocles lichtensteini*: one of WGNP desert residents

environment in WGNP. These are: Red-billed Tropicbird *Phaethon aethereus*, Brown Booby *Sula leucogaster*, Straited Heron *Butorides striatus*, Reef Heron *Egretta gularis*, Goliath Heron *Ardea goliath*, Spoonbill *Platalea leucorodia*, Osprey *Pandion haliaetus*, Sooty Falcon *Falco concolor*, Sooty Gull *Larus hemprichii*, White-eyed Gull *L. leucophthalmus*, Caspian Tern *Sterna caspia*, White-cheeked Tern *S. repressa*, Lesser Crested Tern *S. bengalensis*, Brided Tern *S. anaethetus*, and Kentish Plover *Charadrius alexandrinus*. The Crab Plover *Dromas ardeola* probably also breeds sporadically, juveniles and adults of this rare species were observed during summer on the Hamata islands (see Map 7). Table 8 gives estimates of breeding water and sea birds, and birds of prey, on islands and mangroves in WGNP according to observations during 2002–03.

Table 8 Breeding Water and Sea Birds and Birds of Prey, WGNP

Species	Island								
	Wadi el-Gemal	Sandy Islet N.	Siyul	Shawareet	Mahabis	Uj Ladid	Sandy Islet S.	W. Gemal Mangrove	Hamata Mangrove
<i>Phaethon aethereus</i>	old nest			old nest					
<i>Egretta gularis</i>	15			10				X	X
<i>Ardea goliath</i>									?
<i>Butorides striatus</i>	2			5				X	X
<i>Platalea leucorodia</i>	5-10			1-2				X	?
<i>Pandion haliaetus</i>	5							X	X
<i>Falco concolor</i>	185		X	30	X	X			
<i>Larus hemprichii</i>	45		20	?	10	5			
<i>Larus leucophthalmus</i>	200		50	20	20	?			
<i>Sterna repressa</i>	180	100s					>500		
<i>Sterna caspia</i>	20		5	X	?	?			X
<i>Sterna bengalensis</i>	?		?	?					
<i>Sterna anaethetus</i>			700						
<i>Dromas ardeola</i>			1?						
<i>Charadrius alexandrinus</i>	X		4		?	?		?	3

Figure = pairs of breeding birds. X = breeding occurs but no estimates made. ? = probable breeding.
Sources: Baha El Din 2003 and Grieve & Millington 1999

Red Sea islands are extremely important for breeding water and sea birds. Most of the Red Sea seabirds breed exclusively on islands, which are few, highly accessible and vulnerable to disturbance. At least 12 water and sea bird species are known to breed on Wadi el-Gemal Island and the Hamata islands. Because these islands hold internationally important numbers of breeding seabirds, particularly the Red Sea endemic White-eyed

Gull *Larus leucophthalmus*, they were designated as globally important bird areas (IBAs) by BirdLife International.

The Red Sea coast falls along an important migration route for hundreds of thousands of waterbirds, which are seen migrating in flocks offshore. Although most of these birds pass through without stopping, many will rest in the intertidal zone along the coast. The shallow intertidal flats associated with the Hamata mangroves provide an important staging and wintering ground for good numbers of migrant waterbirds, including globally vulnerable species such as the Sociable Plover *Vanellus gergarius*.

Birds of Prey—An outstanding diversity of breeding birds of prey is found in WGNP (nine species), seldom found in any other part of Egypt (Baha El Din 2003). In fact, WGNP is unique among Egypt's PAs in maintaining a high species richness of birds of prey, including one globally threatened species (Lappet-faced Vulture *Torgos tracheliotus*) and one rare and declining species (Lammergeyer *Gypaetus barbatus*) (see Map 8).

Since birds of prey are placed high on the trophic cycle (being predators), they are ecologically sensitive and are usually considered good indicators of the health of the ecosystems they inhabit. Thus, the high species richness recorded in WGNP perhaps reflects the health of the local ecosystem and relative abundance of prey items. It also reflects the limited disturbance WGNP still enjoys. Birds of prey have declined all over Egypt (as is the case in many parts of the world) due to hunting, falcon catching, habitat loss, pesticide use, and pollution.

The most common species of birds of prey in the inland desert habitats include Lanner Falcon *Falco biarmicus*, Long-legged Buzzard *Buteo rufinus*, Egyptian Vulture *Neophron percnopterus*, Pharaohs Eagle Owl *Bubo ascalaphus*, and Hume's Tawny Owl *Strix butleri*. Bonelli's Eagle *Hieraaetus fasciatus* and the magnificent Lammergeyer *Gypaetus barbatus* are very rare breeders, only discovered in the region during fieldwork in the spring of 2003 (Baha El Din 2003).

Along the coast Osprey *Pandion haliaetus* is a widespread and characteristic resident breeding bird of prey in WGNP. It nests on the islands of the region and in mangroves on the coast. The Egyptian Red Sea population is one of the largest in the world (Goodman & Meininger 1989). The Sooty Falcon *Falco concolor* is also a prominent breeding species on the islands of the region, which hold a large proportion of its small world population.

The globally threatened Lappet-faced Vulture *Torgos tracheliotus* occurs regularly in the region, particularly around the Sheikh Shazli settlement, and at least one pair is known to breed locally.

Desert Birds—A considerable diversity of terrestrial birds occurs in the desert habitats of the Hamata–Wadi el-Gemal region (see Map 8). Characteristic birds of mountain and wadi desert include Sand Partridge *Ammoperdix heyi*, Desert Lark *Ammomanes deserti*, Trumpeter Finch *Rhodopechys githagina*, Mourning Wheatear *Oenanthe lugens*, Hooded

Wheatear *Oenanthe monacha*, Crowned Sandgrouse *Pterocles coronatus*, and Brown-necked Raven *Corvus ruficollis*. Characteristic birds of desert plains include Spotted Sandgrouse *Pterocles senegallus*, Bar-tailed Desert Lark *Ammomanes cincturus*, and Hoopoe Lark *Alaemon alaudipes*.

MAMMALS



WGNP holds one of the healthiest populations of the threatened Dorcas Gazelle *Gazella dorcas* in Egypt

rueppellii, and Striped Hyena *Hyaena hyaena*. The mountain community is characterized by Nubian Ibex *Capra nubiana*, Hyrax *Procavia capensis*, Egyptian Spiny Mouse *Acomys cabirinus*, and the Bushy Tailed Jird *Sekeetamys calurus*.

The area holds one of the largest and healthiest populations of Dorcas Gazelle *Gazella dorcas* in the Eastern Desert. Up to 60 animals were counted in the downstream portion of Wadi el-Gemal in April 2000 (Baha El Din 2003). Wadi el-Gemal and its tributaries represent an important refuge for gazelles, particularly during drought years, when browsing is limited over much of the southern section of the Eastern Desert. Animals from a large area probably congregate in the Wadi to take advantage of its abundant vegetation.

Nubian Ibex *Capra nubiana* numbers are limited and confined to areas where surface water is available readily. The Barbary Sheep *Ammotragus lervia* possibly still exists in very small numbers and is in urgent need of some conservation action.

Carnivores are generally scarce, the most commonly seen being Rüppell's Sand Fox *Vulpes rueppellii*, while the Stripped Hyena *Hyaena hyaena* is present but in small numbers. The Sand Cat *Felis margarita* and the Caracal *Felis caracal* are likely to occur rarely in the

There are some 24 terrestrial mammal species known from the Wadi el-Gemal–Hamata area (Osborne & Helmy 1980, Qumsiyeh 1985, GEF 1997, Baha El Din 2003) (see Map 9). The mammal community of the wadi and plain habitats includes the Desert Hedgehog *Paraechinus aethiopicus*, Dorcas Gazelle *Gazella dorcas*, Lesser Gerbil *Gerbillus gerbillus*, Greater Jerboa *Jaculus jaculus*, Cape Hare *Lepus capensis*, Rüppell's Sand Fox *Vulpes*

region. They are both known sporadically from the rocky and sandy desert habitats of the Eastern Desert.

CETACEANS

Gladstone & Fisher (2000) listed 13 species of cetaceans from the Red Sea. These include the Common Dolphin *Delphinus delphis*, Bottlenosed Dolphin *Tursiops truncatus*, and pilot whale *Globicephala spp.* The Bryde's Whale *Balaenoptera ednei* has been reported from the Farasan Islands off southern Saudi Arabia. A fourteenth species, the Humpback Whale *Megaptera novaeangliae*, was photographed off Ras Mohamed, Egypt in the 1990s (Debelius 1998).

The number of cetacean species and their status in the PA remains unknown. The Spinner Dolphin *Stenella longirostris* appears to be common in many areas of the PA. Four subspecies of *Stenella longirostris* have been described worldwide (Perrin 2002). The subspecies status of the Red Sea population remains unknown, but is currently retained under *Stenella longirostris longirostris*. This species is listed as 'conservation dependent' in the IUCN Red List.



Spinner Dolphins *Stenella longirostris* congregate at several localities in WGNP

DUGONGS

The Dugong *Dugong dugon* is widely distributed in the Red Sea (see cited literature in Preen 1989), but densities are not homogeneous throughout its range. For example, the most important dugong populations in Saudi Arabian Red Sea waters are concentrated in three areas with a mean density of 0.22 ± 0.04 SE dugong per km². This density is comparable with eastern Australia, where dugongs are still common.



Dugong *Dugong dugon* photographed recently off the delta of Wadi el-Gemal

The distribution and abundance of Dugong in Egyptian waters has not been

assessed in detail. Gohar (1957) collected specimens from near Hurghada. Riegel & Luke (1997a) reported that dugongs regularly occur in areas south of Ras Banas, and isolated populations existed at Safaga Bay, Um Redj, and Marsa Embarak. Dugongs are also commonly observed in waters near Wadi el-Gemal (K. Ehlert, Manager, Sharms Alam Diving Center, pers comm. December 2002). In March 2003, T. Roupheal, PSU, and A. Salam, EEAA, observed a dugong swimming in shallow waters opposite the Sharms Alam Resort near Wadi Gemal. The area where the dugong was swimming had seagrass meadows composed of *Syringodium* and *Halodule*, and large mono-specific meadows of *Halophila stipulacea*. The most recent dugong sightings were a juvenile (± 1.5 m in length) swimming close to the fringing reef adjacent to Sharms Alam Resort and an adult (± 3 m in length) near Ras Baghdadi (K. Ehlert, Manager, Sharms Alam Diving Center, pers. comm. April 2003).

Recent sightings of this species in the PA are shown in Map 10. Also shown is the location of dugong feeding trails. Feeding trails, created when dugongs feed on seagrass rhizomes, were observed in *Halodule uninervis*/*Halophila ovalis* meadows at Umm El Abas and Ras Baghdadi (T. Roupheal, pers. com. April 2003). According to Preen (1993) *Halodule* and *Halophila* are the preferred food because of their relatively high nutritional value.

ENDANGERED SPECIES

Besides holding a great diversity of biological components, the PA supports several threatened and rare taxa of fauna and flora (see Table 9). The Barbary Sheep *Ammotragus lervia*, Dorcas Gazelle *Gazella dorcas*, Dugong *Dugong dugon*, Nubian Ibex *Capra nubiana*, Sand Cat *Felis margarita*, White-eyed Gull *Larus leucophthalmus*, Spoonbill *Platalea leucorodia archeri*, Green Turtle *Chelonia mydas*, Hawksbill Turtle *Eremochelys imbricate*, and Mangrove Trees *Avicennia marina* are among the globally endangered biological components of conservation concern (according to IUCN) that are found in the PA.

Table 9 Globally Threatened Species in WGNP

	Global Status	Local Status	English Name	Latin Name
Mollusks	Lower Risk	Common	Tridacna	<i>Tridacna maxima</i>
	Lower Risk	Common	Tridacna	<i>Tridacna squamosa</i>
Reptil	Endangered	Uncommon	Green Turtle	<i>Chelonia mydas</i>
	Critically Endangered	Uncommon	Hawksbill Turtle	<i>Eremochelys imbricata</i>
Birds	Vulnerable	Uncommon	Lappet-Faced Vulture	<i>Torgos tracheliotus</i>
	Vulnerable	Rare	Spotted Eagle	<i>Aquila clanga</i>
	Vulnerable	Uncommon	Imperial Eagle	<i>Aquila heliaca</i>
	Vulnerable	Rare	Lesser Kesterl	<i>Falco naumanni</i>
	Near Threatened	Common	White-eyed Gull	<i>Larus leucophthalmus</i>
M	Near	Unknown	Pipistrel Bat	<i>Pipistrellus ariel</i>

Mollusks	Global Status	Local Status	English Name	Latin Name
	Lower Risk	Common	Tridacna	<i>Tridacna maxima</i>
	Lower Risk	Common	Tridacna	<i>Tridacna squamosa</i>
	Threatened			
	Vulnerable	Rare	Dugong	<i>Dugong dugon</i>
	Near Threatened	Rare	Sand Cat	<i>Felis margarita</i>
	Critically Endangered	Extinct	Leopard	<i>Panthera pardus</i>
	Data Deficient	Common	Rueppels Sand Fox	<i>Vulpes rueppelli</i>
	Critically Endangered	Rare	Barbary Sheep	<i>Ammotragus lervia</i>
	Endangered	Uncommon	Nubian Ibex	<i>Capra nubiana</i>
	Vulnerable	Uncommon	Dorcas Gazelle	<i>Gazelle dorcas</i>
	Near Threatened	Uncommon	Stripped Hyaena	<i>Hyaena hyaena</i>
	Lower Risk	Uncommon	Spinner Dolphine	<i>Stenella longirostris</i>

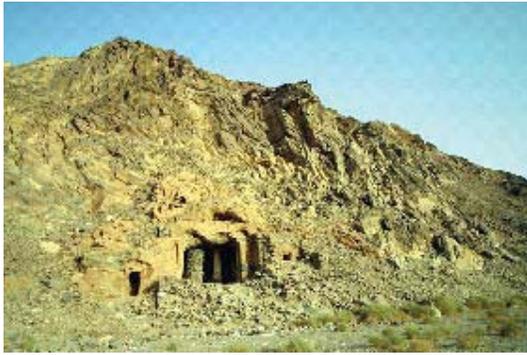
Source: IUCN, 2002

Cultural Heritage Resources

Archaeological surveys and excavations conducted since 1991 in and on the immediate periphery of the region indicate that the WGNP has 38 cultural heritage sites ranging in date from Ptolemaic (late 4th–early 3rd century BC) to Islamic (Appendices 14 and 15, Map 11). The sites include road stations, some of which are fortified wells (known to the Greeks and Romans as ‘hydreumata’) along the trans-desert routes between Berenike (Berenice) and Edfu/Koptos (Hodos Berenikes) and along the Via Hadriana, a highway built in the 2nd century AD and used until late antiquity that—in the area under consideration here—ran parallel to the Red Sea coast. The Via Hadriana originally extended from Antinoë/Antinoopolis on the Nile in Middle Egypt near modern Sheikh Ibada over to the coast near Ras Gharib and then paralleled the coast, terminating at Berenike. There are also gold and beryl/emerald mines and associated settlements, animal tethering lines (used by crews that resupplied and carried quarry/mine products between the Eastern Desert and the Nile), cemeteries, and late Roman sites (4th–early 6th century AD) of unknown function. The latter may be Christian laura communities (Sidebotham 2003).

Appendices 14 and 15 present a list of known archaeological sites in and on the periphery of WGNP. Most of these sites have not been well studied or documented yet, and many other smaller sites might still be unknown. Continued surveying of the region will undoubtedly reveal the existence of other ancient remains. Also not included in this study are the numerous secondary and minor ancient roads, routes, and paths, and isolated graves and tombs in singles or small clusters that have been found throughout

the region. These lists do not claim to be exhaustive. Not listed are numerous segments of ancient (unpaved) cleared road segments, which, in many cases, are marked with cairns and/or towers. There are also segments of numerous secondary ancient roads, mountain paths (some artificially cut through the passes which they traverse) and hundreds of ancient graves (most of which have already been robbed).



Temple of Isis at Wadi Sikait, WGNP

A number of sites are most likely to attract interested laypersons and have the potential to become important archaeological attractions within WGNP through a combination of their good state of preservation and/or size and ease of access. These include Dweig, Wadi el-Gemal, Sikait, Middle Sikait, Umm Harba, Kab Marfu'a, Nugrus, Gebel Zabara, Abu Hegilig South, Wadi el-Gemal east, and Seyhrig (see Appendices 14 and 15 for further details).

Evidence of prehistoric sites (ancient burial grounds, and prehistoric tools) is also scattered in many parts of the PA, but little information is available, as these sites have not been studied or documented yet (H. Barakat pers. comm.).

At the southwestern border of the PA, lays the Shrine of Abu el-Hassan el-Shazli, the most famous Islamic shrine in the Eastern Desert. El-Shazli is one of the figures of Sufism and his roots link to Prophet Mohamed (peace be upon him). He was born in Morocco, where he grew up and became a religious thinker.

El-Shazli traveled widely in his religious quest. He traveled to Baghdad and then Tunisia, where he lived in a town called Shazla (hence his name). Then he moved to Tunis, where he became a popular figure. He eventually traveled to Egypt and stayed in Alexandria, where he preached in Al-Attarin Mosque. Then he moved to Cairo and after that to Upper Egypt.

In the year 1258, on his way to perform the pilgrimage to Mecca, Abu el-Hassan el-Shazli died in Wadi Homaythara, where he is buried. A shrine was built for him and became a popular pilgrimage site for the followers of his school. Thousands of people visit the Sheikh Shazli tomb every year from all over Egypt and North Africa (up to 150,000 in 2002). A big religious celebration is held every year before the Bairam feast (Al-Adha). The Ministry of Islamic Endowments built the new Shazli Mosque in 1969.

Indigenous People

The Ababda are the main indigenous inhabitants of the PA. They are descendents of the Begga tribe, and are among the first peoples to inhabit the desert between the Red Sea and the Nile River. Since the 1st century of the Islamic Hijra, they entered Islam and merged with Arab tribes. Ababda are divided into four tribal groups: Al-Gamila, Al-Fokra'a-Milkab, Al-Abodeen-Shanateer, and Al-Ashabab.

The Ababda have their own traditions, habits, and cultures that are different from other Eastern Desert tribes. Grazing is the prime profession; they shepherd camels, sheep, and goats. They also collect plants for food or trade. They are famous for their charcoal made from

the trees of the region. Hunting is not a main profession, but a clever hunter is considered an important man. They use only a few hunting tools such as traps, stones, and trained dogs. They are nomadic, seeking areas with recent rainfall and good pasture. Their dwellings are small temporary structures called "Khisha". They use tree branches to build the house and cover the frame with cloth and wool. Houses are built on relatively high places at the wadi edge to avoid sudden floods. Women build the houses, and each house is considered their private property.



Grazing is one of the most important activities for local inhabitants in WGNP

other valuables.

In WGNP there are Ababda concentrations in Wadi el-Gemal, Wadi Ghadeer, Abu Ghusoon, and Qulan. In Wadi el-Gemal and its tributaries, there are about 15 families belonging to Ababda tribes (Zidab, Kergab, and Nafi tribes). They work in grazing, making charcoal, and as guards in the mines in the area. At the mouth of the valley, there are two families working in fishing and tourism. In the Hamata area, especially on the coast at Mastora and Qulan, there are 20 families (Al-Okda, Al-Kamilab, Al-Nafi, and Al-



Two Ababda girls in Wadi el-Abyad, WGNP

Ababda go to their Sheikhs and tribal elders to solve conflicts. In front of an arbitration council, the two sides of a conflict explain their cases and leave the final decision in the arbitrators' hands. The council declares its decision at the

end of the session. The judgment usually dictates that the guilty person give up a certain number of camels or

Kergab) working in fishing and tourism. There are three families (Kergab) in Wadi Rada working in grazing and making charcoal next to the Rada well.

3. Existing Land Uses

Mining and Quarrying

The Red Sea Governorate contains the majority of the basement rocks in Egypt. These rocks dominate Wadi el-Gemal National Park and provide many metallic and non-metallic ores, and building materials. The Red Sea is famous for its granite and marble, which competes with those from Italy. Archaeological sites at Nugrus, Sikait, and Um Lasaf have clarified the role of Beryl mining during Roman times. White, gray, and black granite are widely distributed in the area, especially Gebel el-Abyad along Wadi Shawab. Mines associated with basement rocks are iron (Ilmenite), copper, gold, vermiculite, nickel, manganese, asbestos, mica, quartz, and feldspar (Appendices 2 and 3, Map12). Other ores associated with sedimentary rocks are iron oxides, kaolin, potash, and phosphate. Phosphate is now the most important ore in the Red Sea Governorate (ICP 2000).

Sedimentary sequences of the coastal area also include large amounts of gypsum, anhydrite, sand, and gravel.

Alluvial fans, braided streams, and raised beach, widely distributed along the coast are mainly composed of gravel and sand (about 90 percent)

siliciclastics (quartz and feldspars). The major

uses of these are in construction, particularly as concrete aggregate, road aggregate, and other construction materials. Sand is also widely used as beach fill along the Red Sea coast. Their particle size, composition, and physical quality make it one of the preferred aggregates for construction. Deposits close to granite rocks are rich with feldspars, which can be used in ceramics. The occurrence of aggregates on the surface and their proximity to the roads and cities are obvious attractions. As development increases, the demand for aggregates is a target for exploration; therefore, the conflict between economics and the environmental must be anticipated.



Mine workers at Abu Ghalaqa Mine, WGPN

Fisheries

Barrania & Ibrahim (2003) provide a comprehensive description of the status of fisheries in the PA. Traditional local fishermen are increasingly leaving the industry for more lucrative opportunities in the dive and hotel industries. The Red Sea communities were essentially fishing centers. Before the tourism boom, fishing and mining were major activities in the Red Sea region. Two groups target fisheries resources in the PA: local fishermen (Ababda) and migratory fishermen from other governorates. The principal fishing methods used by the traditional fishermen are handlines, gill nets, and trammel nets. Migratory fishermen from the Fayoum Governorate are replacing the traditional fishermen but have less knowledge about the local ecology and sustainable fishing practices. For example, the settler fishermen use illegal gill nets called ‘sabeb’, which have smaller mesh size than that stipulated by the law.

There are seven fish landing sites in the PA: Sharm el-Luli (11 boats/ 55 fishermen); Qulan Village (4 boats/20 fishermen); and Hamata Harbor (10 boats/50 fishermen) (Barrania & Ibrahim 2003). The total tonnage taken from the Marsa Alam–Ras Banas area was estimated at 500 for 2002. The dominant catch in this area include mullet, mojarras, and parrotfish.



Local fisherman in Qulan Mangroves, WGNP

A recent report described the fishing activities of the Ababda from the Qulan village. Fishing is done from boats or from the shore using nets. The village has four boats, one of which is motorized. All the boats are registered at El-Quseir and the fishermen are members of the El-Quseir fishing cooperative. The Ababda reported that fishing resources have diminished and that they needed to go further away to maintain catches. The fishing season is in summer, and lasts for about 6 months. At the peak of the fishing season, the catch can range from 100–150 kg per week per boat.

The report did not indicate the target species.

Tourism

The Red Sea is famous as a tourist attraction on both domestic and international levels. The natural resources of the Red Sea are diverse and unique. Coral reefs provide a major impetus for tourist development throughout the tropics (Hawkins & Roberts 1994). Desert safaris are also popular. Historic sites, mainly Roman, widely distributed in the desert, attract interested people. The warm weather year round integrates these

attractions and makes the Red Sea a special destination. Also of importance is the location of the Red Sea Governorate, as a gate to visit Upper Egypt and its Pharaonic attractions at Qena, Luxor, and Aswan (see Map 13 for distribution of tourism resources in WGNP).

It is estimated that there are upwards of 2 million tourists—including 1.5 million foreigners—annually visiting the Red Sea Governorate, with the majority in the Hurghada area (Cesar 2003). This is likely to change in the future as more tourism facilities open in the south. The current tourism development pattern in the Red Sea Governorate is best described as “strip development” with wall-to-wall resorts lining the coast. Tourism resorts are scattered along the Red Sea from El-Gouna, 35 km north of Hurghada, to Wadi Lahmi some 100 km south of Marsa Alam. According to one source, there are now 30,150 rooms on the Red Sea coast, with another 87,301 under construction, and projections of 115,000 rooms between Hurghada and Marsa Alam by 2012 (Egypt Almanac 2003). The Tourism Development Authority (TDA), Ministry of Tourism is a driving force behind this development along the Red Sea, having been given jurisdiction over the large tracts of coastline that it sells to investors.

Like elsewhere along the Red Sea coast, the southern Red Sea sector is undergoing rapid development for tourism. While Marsa Alam remains a small coastal community, to the north between Quseir and Marsa Alam, a huge tourism center is under development that will rival Hurghada and Sharm el-Sheikh. A number of tourism villages are open in this area, while dozens of others are planned or under construction. The largest of these resorts is Port Ghalib, an 18-km stretch including a marina with berths for 1,000 yachts and hotels providing 4,000 rooms. A golf course and other facilities will cater to tourists (pers. comm. Ed Coe, RSSTI). The recent opening of an international airport north of Marsa Alam is expected to act as a catalyst accelerating tourism in this sector. While the airport is mainly serving charter flights at present, scheduled local flights have begun and the area is expected to receive millions of tourists annually.

The area south of Marsa Alam only opened for tourism development and visitation a little more than 5 years ago. Approximately eight hotels are in operation or under construction between Marsa Alam and Wadi Lahmi (north and south of WGNP), including several tourist villages and smaller eco-lodge type hotels. Other hotels are planned for the area. Although there is a moratorium on tourism development south of Wadi Lahmi, rumors persist of plans to develop the Ras Banas area for tourism, and the construction of a road between Aswan and Bernice linking the Nile Valley and the Red Sea will promote this.

There are hotels adjacent to the PA. The Shams Alam Hotel is situated in the northern buffer zone of the WGNP, while the Zabargad and Lahmi Bay Hotels are located along the southern marine sector of the PA. As part of the PA decree, two “Ecotourism Development Areas” were designated along the coast. The details of the type and extent of development that could be allowed in these areas is currently being elaborated by

TDA in consultation with NCS/EEAA (see further comments under management issues).

Tourism in the southern Red Sea mainly caters to the package tourism market. Most tourists come on tours organized through foreign tour operators. The majority of tourists in the Marsa Alam area are coming for either diving or leisure holidays, with the latter increasing in number. Leisure tourism mainly involves the sun, swimming, and general relaxation.

There were a reported 63,000 tourists in the Marsa Alam area in 2000, nearly all foreigners (Caesar 2003). Formerly, Germans were the most numerous nationally in the southern Red Sea, mainly coming for diving, but recently they have been overtaken by the Italians who mostly engage in leisure or beach tourism (per comm. Karen van Opstral). Other nationalities reported visiting the area in smaller numbers are: the French, Russians, Americans, and Scandinavians (Cesar 2003). Tourists in the Marsa Alam area tends to be higher quality clients than at Hurghada to the north, with more money spent by visitor per day.

Local tour operators are contracted to provide the transfers and sightseeing excursions, which are sold as optional activities through hotels and foreign tour operators. In the Marsa Alam area, sightseeing excursions are only offered by the tour operators contracted to work with a particular hotel. Excursions by independent contractors are only sold if they cannot be provided by the local tour operator. Currently, the kinds of excursions being offered are limited. One of the most popular day trips is a visit to Shalateen to see the camel market.

The existing tourism to the WGNP is mainly in the marine environment, with the highest visitor use in the vicinity of the Qulan Islands. Dive boats regularly visit the reefs in that area, with the numbers of boats and visitors increasing with the establishment of hotels. Dive boats as well as day-trippers are visiting the offshore islands. Lahmi Bay Hotel is organizing visits to one of the islands in the Qulan Island chain for picnics (pers. comm. T. Rouphael). Some snorkeling takes place along the coast, mainly off the hotel beaches. There has been some bird watching during visits to the islands and coastal mangroves.

Safari tours to the desert areas of WGNP are currently limited due to security restrictions. According to K. van Opstral (pers. Comm.), the Red Sea Governor ordered the Ministry of Interior not to allow visitation to desert areas until the PA management has been established. The most popular form of desert tourism in the Eastern Desert is general adventure tours, camel rides, tea with the Bedouins, and dinners in the desert (pers. comm. K. van Opstral). In the



Entrance of Shams Alam Hotel at WGNP

Marsa el-Alam area, there are larger tourism companies and several small independent operators organizing desert safari tours, including tours to the cultural heritage sites and for stargazing.

There is also national tourism in the Marsa Alam region in the form of pilgrim to religious sites. There are a number of tombs belong to Muslim saints in the area; the most important of these is Sheikh Shazli. These tombs are visited by Egyptians from the Nile Valley and the Red Sea coast, as well as by some individuals coming from abroad. While the tombs are visited throughout the year, the largest numbers of visitors come during the Mulids—celebrations lasting several days for the birthday of the saints. More than 120,000 individuals were estimated to have attended the Mulid at Sheikh Shazli in winter 2003. There are rest houses and other basic establishments in Sheikh Shazli catering to the pilgrims.

Tourism Facilities in the Region

There is a well-developed infrastructure catering to diving and marine based tourism in the vicinity (see Map 13). There is a relatively large marina at Marsa Alam and at a smaller marina at the eco-lodges to the south. There is a pier at the Shams Alam Hotel, which mainly serves the island and the reefs in the northern sections of the PA. There is also a port at Abu Ghusoon that serves the reefs and islands in the southern section of the park. Most of the hotels maintain their own dive shops.

Urban Centers and Settlements

There are three small towns in the buffer zone of the WGNP: Abu Ghusoon, a mining port; Hamata; and Sheikh Shazli. All three contain basic facilities and suffer from environmental problems so are not attractive for tourism. There are also small settlements scattered throughout the PA for local and itinerate workers working in the mining concessions (see Map 14).

Traditional Uses: Grazing, Charcoal Production, and Medicinal Plants Collection

The majority of the indigenous population inhabiting inland parts of the PA practices a combination of grazing, charcoal making, and medicinal plants collection. There is still insufficient information as to the volume of these activities, but given the relatively small population inhabiting the region (2,000–3,000 individuals, FAO 2002) the impact of these activities is likely to be limited.

Roads

There is a good road network linking WGNP with major tourism centers along the Red Sea (Hurghada, Quseir, and Marsa Alam) and the Nile Valley (Luxor and Aswan). The main Red Sea coast road between Suez and the Sudanese border passes through the

WGNP. The PA is also accessible from the Edfu–Marsa el-Alam Road via the asphalt road to Sheikh Shazli, which passes through the western section of the PA. There is an extensive network of dirt tracks and roads in the PA that were established by the mining concerns (see Map 13).

WGNP Stakeholders

There are a large number of direct and indirect stakeholders and participants in the PA's activities. The main stakeholders and their involvement with the PA include:

- ◆ **Egyptian Environmental Affairs Agency**—By law, the EEAA is the competent governmental authority responsible and obligated to manage PAs in Egypt.
- ◆ **Red Sea Governorate**—WGNP as a whole falls under the administrative authority of the Red Sea Governor, who is the highest authority in the governorate. The governorate is responsible for regional planning and development strategies such as housing, roads, and tourism projects. The main governorate departments that have interests in the PA include:
 - **Quarry Department**—responsible for issuing quarrying licenses
 - **License Administration**—responsible for issuing building and development licenses
 - **City and village councils**—responsible for municipal development planning, water and power supply, rubbish collection and liquid waste disposal.
- ◆ **Tourism Development Authority**—TDA is responsible for the planning of tourism developments, and the allocation and sale of land for investors in designated tourism areas. The TDA is responsible for providing building standards to developers and ensures compliance with building regulations. Much of the Red Sea coast (to a depth of 5 km inland) is owned by the TDA.
- ◆ **Higher Council for Antiquities**—Has responsibility for surveying and protecting antiquities and archaeological sites.
- ◆ **Ministry of Interior**—The Ministry of Interior has under its authority the Police (including its various branches). It is the executive authority for Egyptian civil legislation.
- ◆ **General Organization for Roads and Bridges**—Is responsible for the maintenance of existing roads and construction of new ones.
- ◆ **Border Guards**—The Border Guards have the responsibility to protect all border regions of Egypt, including its coasts. Border Guards control access to the marine environment, and they request the issuance of permits for non-Egyptian visitors to off-road regions of the Eastern Desert.

- ◆ **Investors** (hotel owners, tour operators, dive boats, guides, desert safari companies, etc.)—Investors and beneficiaries of the Red Sea ecosystem have a direct stake in the ecological state of the region, and should have an interest in maintaining a high quality environment in the region.
- ◆ **Local Communities**—The local Ababda communities are the traditional users of the natural resource base and as such are among the main stakeholders in the PA. Their understanding and support of the PA's objectives and involvement in planning and implementing management interventions are critical. Local communities should be enabled to manage their own resources locally but as local communities may have to restrict their activities and so pay the opportunity costs for conservation, they should be entitled to share tangible benefits from the management of the PA to offset such costs and ensure their support.
- ◆ **Ministry of Agriculture**—The MoA and several of its subsidiary organizations are actively involved in the region:
 - **General Authority for Fisheries Resources Development**— GAFRD is the official governmental authority in charge of regulating and developing fisheries and fish resources in Egypt. They have a large interest in any management measures that might affect the fish production in any region.
 - **The Desert Research Center**—This organization is finalizing an agreement for a local community development project in the southern part of the Eastern Desert with funding from the World Food Program, which could involve the introduction of widespread water harvest measures (e.g. small dams in wadis) and drilling shallow wells. Some of these activities are likely to encompass WGNP.
 - **The Locust Control Department**—This department uses vast amounts of pesticides in many parts of the Egyptian deserts when locust invasions are anticipated.

Current Conservation Capacity at WGNP and Vicinity

Other than WGNP, there are currently (in practice) two other PAs in the Red Sea Governorate: The Red Sea islands and coastal mangroves (south of Lat. 27°15') and the Elba PA (from north of Shalateen to the boarder with Sudan).

The Red Sea PA regional headquarters is located in Hurghada, with satellite offices at Quseir, Marsa Alam, and Shams Alam. Existing management mainly focuses on monitoring and enforcing Law 4/1994 and the regulations pertaining to coastal tourism development, patrolling, and monitoring; visitation to the protected islands; buoy establishment; and monitoring reef damage by tourists. The management of WGNP is still under development, although a park manager and three rangers plus two contract community guards and a boat manager have been appointed as of March 2004.

Currently, the NCS/EEAA capacity in the WGNP region is limited, though improving. As of June 2003, four rangers were assigned to an office based in Marsa Alam, equipped with a single Jeep. Since October 2003, a ranger station in Shams Alam, at the entrance of WGNP, has been established with its own vehicle, equipment and support facilities. The primary mission of park staff is to patrol a swath of the Red Sea coast extending from about Wadi Lahmi to Marsa Trombi. The rangers inspect coastal activities (mainly development) to ensure that no violations to the coastline occur. Rangers also carry out interpretation and some outreach for the tourists visiting the Park.

Further south in the Elba PA, up to 20 rangers are assigned to manage this 35,000 km² territory, with very limited resources.



4. Management Goals and Objectives

The management goals and objectives of WGNP need to reflect both national policies and priorities, and local circumstances and needs. As well, the PA management should seek to adopt to the extent possible, established international standards in this field (IUCN). These standards have evolved over many years and reflect an extensive global experience, presenting practical and tested solutions to common management problems.

IUCN Protected Area Management Category and Its Objectives

WGNP is designated herein primarily as a National Park (PA managed mainly for ecosystem protection and recreation, IUCN PA management category II). This defines the PA as a “natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations; (b) exclude exploitation or occupation inimical to the purposes of designation of the area; and (c) provide a foundation for spiritual, scientific, educational, recreational, and visitor opportunities, all of which must be environmentally and culturally compatible.”

The selection criteria set out by IUCN for this category is:

7. The area should contain a representative sample of major natural regions, features, or scenery, where plant and animal species, habitats, and geomorphological sites are of special spiritual, scientific, educational, recreational, and tourist significance.
8. The area should be large enough to contain one or more entire ecosystem not materially altered by current human occupation or exploitation.

WGNP fits perfectly the National Park criteria: it is of substantial size; encompassing a unique example of a complete marine/terrestrial ecosystem not significantly altered by man, and largely in pristine natural condition; has outstanding landscape features; holds a significant recreational value; and has sites of important spiritual and cultural significance.

It should be noted that some minor sections of WGNP would not qualify or be managed within the above National Park criteria, such as the two designated ecotourism development zones on the coast. These areas will be subject to a special zoning scheme within the National Park and will have modified management requirements aimed at developing a sustainable, non-degrading use of the Park’s resources.

Management Objectives

IUCN outlined the following management objectives for National Parks:

1. To protect natural and scenic areas of national and international significance for spiritual, scientific, educational, recreational, or tourist purposes;

2. To perpetuate, in as natural a state as possible, representative examples of physiographic regions, biotic communities, genetic resources, and species, to provide ecological stability and diversity;
3. To manage visitor use for inspirational, educational, cultural, and recreational purposes at a level that will maintain the area in a natural or near natural state;
4. To eliminate and thereafter prevent exploitation or occupation inimical to the purposes of designation;
5. To maintain respect for the ecological, geomorphologic, sacred, or aesthetic attributes that warranted designation;
6. To take into account the needs of indigenous people, including subsistence resource use, insofar as these will not adversely affect the other objectives of management.

National Objectives for Protected Areas

The Protected Areas Network of Egypt aims at maintaining the diversity and viability of the various components of Egypt's natural heritage, and to ensure their sustainable utilization through conserving adequate representative examples of the country's natural ecosystems and landscapes for the benefit of present and future generations: the intergenerational equity.

The main objectives PAs Network of Egypt (adapted from NCS/EEAA policy documents) are:

1. To conserve representative examples of all the nation's main natural habitats and physiographic regions;
2. To help maintain the nation's biological diversity;
3. To help maintain the nation's ecological viability;
4. To protect the nation's most outstanding landscape features;
5. To optimize socio-economic return from the nation's natural systems in a fashion that ensures their long-term sustainable maintenance;
6. To support Egypt's economic development strategies, particularly with regard to sustaining the tourism sector;
7. To protect natural assets as future options available for economic diversification;
8. To promote public understanding and appreciation of Egypt's natural heritage.

WGNP Management Objectives

WGNP aims at providing protection to the unique and invaluable natural and cultural heritage resources present in the region. At the same time, it seeks to facilitate, ensure, and promote the wise and sustainable use of these resources, maximizing benefits from the natural conditions and systems that govern the sensitive and valuable ecosystems of the region, and maintaining the traditional and characteristic culture of the indigenous inhabitants and improving their living standards.



The main management objectives for WGNP are:

1. To maintain the natural resources and conditions of the PA;
2. To protect cultural heritage resources of the PA;
3. To enhance the sustainable utility of natural resources in the PA through the establishment of appropriate management systems;
4. To promote WGNP as a focal point for ecologically sensitive tourism, thus expanding and diversifying the economic activity base in the region;
5. To enhance the environmental quality of the WGNP;
6. To optimize socio-economic benefits to the indigenous population from the region's natural heritage;
7. To promote public understanding and appreciation of Egypt's natural heritage.

5. Management, Issues, Policies, and Actions

This section reviews the main management problems, obligations, and opportunities for WGNP, providing specific proposed management objectives, policies, actions, and evaluation indicators for each.

Management of Existing Urban Centers

Several existing urban (non-tourism related developments) are found in or just outside WGNP. The town of Abu Ghusoon is the only urban center within WGNP, lying in the middle of the WGNP coast, within the Abu Ghusoon eco-tourism development zone. The town of Hamata and Sheikh Shazli fall immediately outside the PA, but within its buffer zone. These urban centers have the potential for producing localized negative impacts on the PA if current modes of operation are left unchanged. The few Ababda settlements scattered around the PA are small and tend to be mobile and have a limited impact on the natural environment.

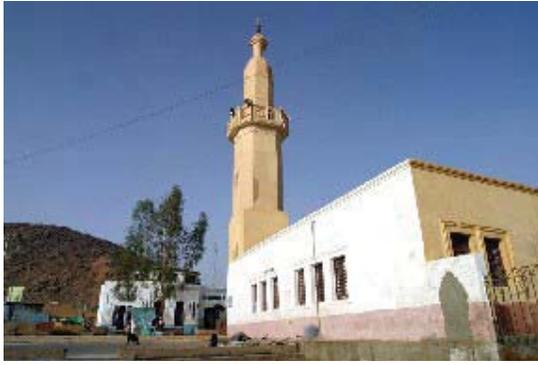
There is a need to launch community development initiatives to upgrade and enhance the urban centers in and around WGNP, particularly concerning solid waste management and providing health care, education, and other social services to the local communities. Grants and loans could be provided to local communities to develop tourism facilities and services; such a project would address poverty alleviation.

Objective: Urban centers within or adjacent to WGNP operate in an environmentally and ecologically sound manner and become aesthetically compatible with the PA, within a planned framework.

Policy: Urban centers in and around WGNP should become environmentally compatible with the PA, through better control of solid and liquid waste, and through proper urban planning, which organizes urban expansion within recognized limits. No new urban centers will be allowed in WGNP. Ababda settlements within recognized traditional use zones will be permitted to grow naturally but all new dwellings are to be built in vernacular style.

Actions:

1. Establish contact and direct communication between the Protected Area Management Unit (PAMU) and the Town or Village Councils of concern.
2. Develop urban planning schemes that take into consideration the conservation character and objectives of WGNP. This could be one of the activities of the forthcoming Livelihood and Income from the Environment (LIFE) Project in the southern Red Sea.



The tomb of Sheikh Sedzli in WGNP

3. Clearly demarcate the current legal limits of each urban center on the ground, in order to detect violations.
4. Enforce suitable building codes that provoke local characteristic architecture and energy conservation.
5. Discourage the use of introduced flora in landscaping.
6. Establish suitable sanitary landfills and waste collection systems at the concerned urban centers. See further instructions under: Solid and liquid waste.

Indicators:

1. Presence of operational sanitary landfills near each urban center.
2. Amount of solid waste in and around urban centers.
3. Urban development plans established and sanctioned by stakeholders.
4. Indigenous trees used for ornamentation.

Coastal Developments

To date coastal tourism developments along the Red Sea coast of Egypt has taken a traditional extensive development approach. This type of linear development already exists or is planned in the Adjacent (Buffer) Zone—as indicated in TDA’s Land Use Management Plan (LUMP)—to the north and south of WGNP (south of Marsa Alam and Hamata, respectively), and overlooking long stretches of the marine component of the PA, with obvious risk to its marine resources. Threats include: Direct damage to coral reefs; sediment plumes from construction operations that degrade the reefs; destruction of coastal habitats; disturbance to plants and animals; and altering floodwater flow, which can be a hazard to the environment and tourists if facilities are built in a wadi bed. Negative impacts reach far into adjacent desert habitats through haphazard building material extraction and solid waste disposal.

The amount of damaged reef flat in the PA is minimal. In many areas of the PA, the reef flats are wide (>500 m). This greatly limits access by tourists to deep water where they can swim or snorkel. Therefore, a few hotel owners have illegally constructed artificial lagoons on the near shore section of the reef flat. In addition to permanently damaging intertidal habitats on the reef flat, the new lagoons may become a chronic source of suspended sediments. Another potential source of reef flat disturbance is infrastructure in wadis. A major flash flood would not only possess a threat to human life, but could result in large amounts of concrete and other construction material being deposited on the reef flat or reef slope.

In addition to PA regulations, TDA's LUMP provides extensive instructions to developers to avoid and reduce damage to the marine environment resulting from construction and operation of coastal developments.

Objective: To minimize as much as possible any current or potential negative impacts from tourism developments in WGNP.

Policy: All violations, such as reef flat disturbance, building within the setback zone, building in wadi (flood) courses, and haphazard waste disposal must be halted. Tourism developments in the WGNP Buffer Zone should become environmentally compatible with the PA, through better control of solid and liquid waste. Establishing suitable sanitary landfills and solid waste collection systems should be a prerequisite for approving all future developments.

Actions:

1. Establish effective communications among the PAMU/EEAA, TDA, and local authorities to ensure implementation of PA and TDA LUMP regulations.
2. Environmental Impact Assessments (EIAs) will be obligatory for all development, installations, facilities, and activities in the Buffer Zone before approvals are granted.
3. The PAMU staff should participate in the assessment of EIAs for proposed developments in the Buffer Zone.
4. All contractors will be obliged to restore the landscape, as far as possible, before leaving any development site.
5. Establish suitable sanitary landfills and waste collection systems for existing and future developments. See further instructions under: Solid and liquid waste.
6. The PAMU to establish and maintain a register of all developments within the Buffer Zone, with a record of environmental conduct.
7. The PAMU to continue to undertake periodic patrols of developments (operational and under construction) to ensure that regulations, such as setback are being followed.
8. EEAA establish and maintain a register of locations in the PA where reef flats have been damaged by infilling or excavation for lagoons (in progress)

Indicators:

1. Number of violations.
2. Operational sanitary landfills.
3. Amount of solid waste in and around tourist developments.
4. Results of reef monitoring programs.

Development of Marsas

A marsa is a natural bay usually at the mouth of a wadi. It is an uncommon feature in the PA. The best examples of undeveloped marsas in the PA include Sharm el-Luli and

Sharm el-Fakera. Marsas have significant ecological and social value. Their sheltered waters provide ideal environments for *Halophila ovalis*/*Halodule uninervis* meadows which appear restricted to shallow water (<10 m) in the PA. Marsa may also support unique coral assemblages because wave exposure is a major factor influencing the abundance and distribution of scleractinian coral. DeVantier *et al.* (2000) describe four coral communities from Saudi Arabian Red Sea waters, of which one, characterized by the scleractinian corals *Montipora spumosa* and *Pavona decussata*, was restricted to marsas and other sheltered areas. Marsas also provide divers, snorkelers, and swimmers with easy and safe access to deep water.

Resort developers also target marsas because they provide safe anchorage/mooring for day boats and are some of the few areas with sandy beaches. Resort construction and operation near marsas pose a serious threat to corals and seagrasses. Increased suspended sediment, associated with construction activity, and elevated nutrient loads, attributed to septic systems or direct sewage discharge from vessels, may stress these organisms, particular in semi-enclosed water bodies where flushing is limited. Boats may also damage coral and seagrasses through grounding or anchoring. Further, anti-fouling paints on boats and oily ballast water may contaminate sediments and the water.

Objective: To ensure that marsas and sharms continue to play their important natural ecological role.

Policy: Stop development near marsas. Maintain all undeveloped marsas as open-space for recreational and passive tourists use.

Action:

1. The PAMU ban all development of resorts and other human habitation in and adjacent to marsas that are currently free of development in the PA.
2. The PAMU monitors activities in marsas in WGNP to ensure compliance.

Indicators:

3. Proportion of undeveloped marsas in the PA.

Development in “Ecotourism Development Areas”

Two zones have been dedicated within WGNP as “Ecotourism Development Areas,”—referred to as Low Intensity Development zones (LIDs) in TDA’s LUMP. One in the north is at Ras Honkorab and the other, larger one, is in the middle section of the PA and includes the community of Abu Ghusoon. According to the PA declaration, the development zones are to be utilized for ecotourism. Tourism development activities within these two zones will have a significant impact on the overall value of WGNP as a valuable asset for diversifying the tourism product in the Red Sea region and in Egypt at large. Activities within the two ecotourism areas should be carefully evaluated and their operations closely monitored to ensure that they do not devalue the Park.

The Ecotourism Development Area in the north at Ras Honkorab is of the highest amenity value for tourism, and should be utilized for more exclusive ecotourism activity. The middle ecotourism development zone around Abu Ghusoon is of moderate ecological importance and aesthetic value, and can be withstand more pressures.

Objective: To ensure that activities in the two Ecotourism Development Areas are in line with the long-term vision of WGNP as a unique ecotourism destination, and that they are compatible with the management objectives of the Park.

Policy: It is proposed that the Ecotourism Development Areas would be left in a largely natural state. If deemed appropriate, only limited exclusive eco-lodge development would be permitted, strictly adhering to the ecotourism standards in TDA's LUMP (not finalized as of 16 March 2004). Important natural habitats and landscapes should be maintained as a priority.

Actions:

1. Finalize the ecotourism standards currently being developed for TDA's LUMP (to be achieved by TDA).
2. EEAA will review these standards and adopt them if deemed appropriate.
3. TDA/EEAA will ensure that these standards are applied to the "Ecotourism Development Areas."
4. The NCS/PAMU must review and verify all EIAs on the ground to ensure that they meet the guidelines and regulations for environmental management, particularly for solid and liquid waste management.
5. The PAMU will ensure that TDA's ecotourism standards are adhered to during construction and future operation.
6. All contractors will be obliged to restore the landscape, as far as possible, before leaving any development site.
7. The PAMU will apply standard set-back regulations, prohibit coastal modification, and prohibit construction in flood (wadi) courses.
8. The PAMU will ensure that all solid waste generated be disposed outside WGNP in designated landfill sites.
9. The PAMU will ensure that all liquid waste is treated on site.
10. The PAMU will prohibit the use of pesticides.
11. The PAMU will prohibit the introduction of exotic species.
12. The PAMU will monitor construction and operation of all facilities.
13. The PAMU will establish and maintain a register of all developments within the ecotourism development zones, with a record of environmental conduct.

Indicators:

1. Number of developments fully compliant with ecotourism standards.
2. Number of violations to development codes.

3. Number of introduced species of ornamentation plants.
4. Number of desert shrubs free of garbage in sample wadi areas.
5. Number of waste items on sample beach lengths.

Sustainable Tourism and Ecotourism Development

Tourism is the most important use of WGNP and its natural and cultural resources. It is a reliable source of sustainable and substantial economic growth in many parts of the world if properly established and managed. In addition to creating economic opportunities and jobs for the private sector and generating benefits for the local community to enhance their standard of life, it is an important source of revenue for the PA to be reinvested back into its management. The facilitation and management of tourism and promotion of ecotourism in WGNP is one of the top management issues for the PAMU.

There have been a number of projects launched to develop sustainable tourism and ecotourism in the Red Sea region. In the 1990s, the GEF Red Sea Project conducted a number of studies about the resources of the area and proposed management guidelines for tourism. USAID has been supporting sustainable tourism development in the Red Sea region since 1994. As part of this initiative, the Red Sea Sustainable Tourism Initiative Project (RSSTI) studied the ecotourism development potential of the southern Eastern Desert, referred to as the “Deep Range,” and developed an “Ecotourism Development Plan” for the southern Red Sea region, focusing on the WGNP area. These studies are a valuable source of information and recommendations on potential tourism activities in the WGNP and adjacent regions. However, these studies have been mostly developed before establishment of the WGNP and do not adequately address the area’s current status as a PA.

Ecotourism is an activity that depends on and promotes a well-maintained, natural environment and has shown to be a reliable source of sustainable and substantial economic growth in many parts of the world, if properly established and managed. WGNP has excellent potential for ecotourism development given its unique natural and cultural heritage resources. A range of nature-based tourism activities can be envisaged taking place in the WGNP, including wildlife watching, diving, snorkeling, and trekking. WGNP has high potential for leisure, recreation, adventure, beach tourism, safari, and cultural heritage tourism.

WGNP management must take into consideration the planned tourism development in the Marsa Alam area that is expected to grow exponentially in the next 5–10 years. Given the few other attractions and activities for tourists in the southern Red Sea, it is envisaged that the WGNP will become a leading attraction and locus for tourism as the PA becomes established and better known. The popularity of WGNP is expected to rival that of Ras Mohamed National Park in South Sinai.

Two main potential target markets for the PA are foreseen to be:

- ◆ Day trips by package tourists on leisure holidays staying at the coastal resorts. While the majority of these would be satisfied with a visit to the more accessible areas of the park, tourists with a higher degree of interest in nature and willingness to pay would probably want to take desert safari excursions or boat trips to the outlying islands.
- ◆ The wildlife and eco-tourists would be expected to spend a longer time in the PA. The majority of wildlife tourists would be divers and snorkelers, while eco-tourists would probably be those who want a more general nature–cultural experience or have more specialized interests, such as bird watching.

Objective: To establish WGNP as a focal point of sustainable ecotourism activities in the Red Sea Governorate, and make conventional tourism to the region more environmentally sensitive and sustainable.

Policy: Priority should be given to the development of ecotourism as one of the means to realize the Park's management objectives. A premium tourism concept should be applied, whereby the number of visitors would be restricted and higher fees charged to visit more sensitive, pristine and exceptional sites.

Actions:

1. Inventory, map, and assess the tourism resources of WGNP as a baseline (achieved to a large extent).
2. Establish a visitor management plan defining appropriate types of activities, routes, visitor facilities, safety, circulation, permitting systems, and carrying capacities for various sites and management zones (achieved to some extent).
3. As part of the above plan, develop a visitor fee structure, as well as licensing and concessions fees for businesses operating in the park.
4. Identify and establish the necessary visitor facilities and infrastructure (achieved to some extent).
5. PAMU develop a plan and system for the maintenance of visitor facilities.
6. Liaise with TDA and other concerned parties to tailor a comprehensive ecotourism plan specifically for WGNP, including a promotion strategy (achieved to some extent).
7. Conduct necessary studies and support the development of two eco-lodges in the PA (achieved to a large extent by TDA).
8. As part of an education and public awareness strategy for WGNP, identify and implement educational and information program for visitors.
9. The PAMU will insure that WGNP visitor regulations are widely disseminated and implemented.
10. The PAMU will seek to reduce negative visitor impacts by regular patrolling of primary attractions and sensitive sites.
11. Train PAMU staff to be responsive to tourist needs.

12. The PAMU will monitor visitor impacts and responses through a comprehensive monitoring program. Impacts from visitors in the marine environment on important reef sites and critical species such as marine mammals; big fish such as sharks, groupers, and sea turtles; and impacts in the desert on critical habitats, e.g. amount of litter, car tracks, and firewood collection, heavily used cultural heritage sites, and species with high tourism appeal, such as gazelles.
13. Establish relationships and form partnerships between the PA, the tourism sector—in particular the local hotels and tour operators, and local communities.
14. The PAMU will seek visitor feedback as a means of assessing management effectiveness.
15. Coordinate with the Coast Guard Intelligence to allow non-Egyptian tourists to visit WGNP without the need for acquiring permits.
16. Coordinate with the Tourist Police to arrange for non-Egyptians' security.
17. Extend the boundaries of the WGNP to include all the key desert tourism routes, particularly the downstream portion of Wadi Ghadir, to ensure proper protection of resources and management of tourism.
18. Involve the local community in tourism activities, such as working as guides, handicraft programs, community-operated eco-lodges, and providing other goods and services to visitors.

Indicators:

1. Number of tourists
2. Percentage of eco-tourists
3. Number of days spent in WGNP
4. Number of repeat tourists
5. Amount of revenue generated per tourist per night
6. Number of visitor facilities established in WGNP.

Public Awareness

Raising local and national awareness of the importance of conservation management for WGNP is essential to achieving the long-term management objectives of the PA. Public awareness in PAs aims to elicit the support and goodwill of stakeholders as a means of meeting conservation management goals. Public support flows from relationships based on trust, respect, and a sense of ownership of the PA. Public awareness is, therefore, about participation, effective two-way communication, and education between the stakeholders and the PAMU/EEAA.

Objective: To ensure public support for long-term PA objectives through the promotion of understanding and valuation of the PA's role and function.

Policy: Public awareness and education will be a priority management activity for the PAMU.

Actions:

1. Intensive direct communications between the PAMU and local stakeholders.
2. In the short-term, establish and continuously update public communication tools (signs, newsletter, brochures, and posters).
3. Establish a detailed Public Awareness Strategy.
4. Respond promptly to all inquiries from the public.

Indicators:

1. Number of supportive stakeholders.
2. Results of public interviews.

Visitor Safety

With an anticipated increase in the number of visitors to WGNP, both to the marine and terrestrial components, visitor safety and security should be considered. Although Law 102/1983 does not attach any particular legal responsibility to the EEAA for the safety of PA visitors, it is implicit and expected that the EEAA would seek to ensure some minimal safety levels for visitors to any PA. This is particularly an issue when visitors start paying an entrance fee and expecting services in return. For example, St Katherine PA established a Mountain Rescue and Medical Emergency Unit.

Emergencies in WGNP could include diving accidents, poisonous stings, dehydration, disorientation in the desert, car accidents, or climbing accidents. An important safety issue in the regularly visited Sikait–Nugrus area is the large number of unmarked, deep, ancient mining shafts that pose potential dangers of serious injury or death to those hiking or trekking in the region.

Objective: Ensure an acceptable level of safety to visitors against the most likely life threatening incidents in WGNP.

Policy: The PAMU should be capable of responding efficiently to medical emergencies. The PAMU will ensure that an adequate system is established and is operational at all times.

Actions:

1. Establish an emergency response plan that should identify the closest hospitals and doctors in the region and “best practices” for each of the most anticipated incidents in WGNP.
2. The PAMU staff should include one doctor, who should receive specialized training in emergency treatments.

3. Other PAMU staff should get training in basic rescue and emergency medical response.
4. An emergency phone number should be designated and distributed to visitors. That phone should be attended at all times.
5. Conduct awareness campaigns among tour operators and ensure that visitors are aware of the emergency procedures.

Indicators:

1. Number of treated incidents.

Roads

Roads have long-term ecological, social, and environmental impacts. The construction of roads into formerly inaccessible areas could have major ecological and aesthetic impacts.

During construction and subsequent maintenance, especially in difficult terrain, important habitats can be damaged and lost and critical flood patterns can be disrupted, affecting natural vegetation patterns. Roads fragment natural landscapes and disrupt the free movement of wildlife. Unexpected traffic can kill wild animals unused to coping with this new hazard. Roads have a direct effect on socio-economic activities in the areas they pass through and can lead to widespread changes in the cultural landscape of an entire region.

Important regional and national highways pass through the eastern and western fringes of WGNP. The main coastal highway linking the northern and southern Red Sea passes along the Red Sea coast. Additionally, a tarmac road linking Sheikh Shazli with the Marsa Alam–Edfu road passes along WGNP's western boundary. Regular and commercial traffic inevitably come in close contact with some of the more sensitive resources of the PA. In some areas, through traffic kills wildlife, most significantly large mammals. This is particularly significant at Ras Baghdadi, where gazelles often cross the main road.

Objective: Reduce risks from major surfaced roads.

Policy: No new surfaced roads will be allowed within WGNP. The position (route) of currently existing surfaced roads will be maintained. No adjustments or re-routing should be allowed except in the case of risks to public safety. EIAs must be submitted for any significant road adjustment in WGNP. Generally, through traffic will be restricted to the main highways. Leaving the highways is banned, except for PA visitors (paying or permitted visitors) and to local inhabitants. In the meantime, the PAMU should capitalize on the opportunity to educate transient visitors to the PA. Reduced speed limits should be introduced at regular wildlife crossing areas of the coastal highway.

Actions:

1. The NCS/PAMU will liaise with the Ministry of Public Works and the Red Sea Governorate to review road development plans in the region and ask to introduce speed reduction ripples at critical wildlife crossing areas, particularly at Ras Baghdadi.
2. The PAMU will inform maintenance contractors of road construction standards.
3. The PAMU will seek to restore road lines by removing spoil tips resulting from previous maintenance and repair (e.g. broken asphalt), and in the future enforce the removal of such spoil by maintenance contractors.
4. The PAMU will establish informative signs and instructions to alert drivers and passengers that they are in a PA and indicate reduced speed limits in wildlife crossing areas.
5. The PAMU will provide rest areas with an educational context, to capitalize on the presence of casual travelers in the PA.

Indicators:

1. Length of new surfaced roads.
2. Amount of road construction related debris.

Off-road Vehicle Use

Off-road vehicle use has increased dramatically throughout the deserts of Egypt in recent years. Off-road driving is environmentally damaging to fragile desert ecosystems, causing soil erosion and compaction, crushing plants, and disturbing wildlife. The



Off-road vehicles traversing WGNP

The growing development pressure, increase in human population, particularly tourists, and increased availability of 4×4 cars mean that the volume of off-road traffic in WGNP is causing a growing impact. Multiple braided tracks are especially noticeable in wider wadis and plains, and control and remedial measures are now required.

Objective: To regulate and limit, as far as possible, off-road driving within the PA.

Policy: All lands within the PA are considered as either limited or closed to vehicles. Driving off the main surfaced highways is prohibited, except for PA visitors (paying or permitted visitors), local inhabitants, and vehicles working with permitted activities inside the PA. All off-road vehicles will be restricted to the main existing tracks in WGNP, which are to be designated on management maps and marked on the ground. Routes are

considered to be open unless indicated as closed on the ground by signs, barricades, or other physical considerations that appropriately direct the user.

Actions:

1. Survey and categorize various tracks according to their sensitivity to wildlife, importance to traffic, and connectedness to habitations and sites of interest.
2. Identify areas that need to be sealed off completely or where traffic should be diverted to avoid critical areas and where severe disturbance is being caused by traffic.
3. Improve single tracks in critical habitats or where vehicles are making multiple or braided tracks, making it less practical to drive off tracks. Tracks can be improved at particularly bad patches where drivers tend to try better alternatives.
4. Place obstacles (large rocks etc.) at critical points in an aesthetic fashion in order to force drivers to follow a particular route.
5. Seal terminal parts of critical wadis with no through passage to vehicular traffic, by placing natural boulder obstacles to prevent car access, but allow for the unobstructed passage of wildlife and floodwaters, e.g. upper Wadi Halous. This will undoubtedly improve habitat conditions for wildlife in these areas and access on foot and by camel would be allowed.
6. Liaise with safari operators about permitted routes and an enforceable code of conduct
7. Post obvious and easy-to-read instructions with codes of off-road driving at the entrances to important and heavily used tracks, clearly indicating the penalties for misconduct.

Indicators:

1. Number of car tracks outside main track in sensitive wadis such as Wadi el-Gemal.
2. Number of track kilometers maintained.

Anchoring

Most tourist vessels operating in the PA, in addition to many of the fishing boats, must, at some time, remain stationery near reefs or other features that tourists wish to view or fishermen target for fishing. Anchoring or mooring are two ways that vessel remain temporarily fixed at a given location. Unfortunately, anchors and anchor chains are potential sources of coral reef damage. Anchors can break, crush, or push over coral colonies. Anchors and their chains can crush, sever, and scour other sessile benthic organisms such as soft corals and seagrasses. In recent years, the number and size of tourist boats has increased in the southern Red Sea, making their potential damage even greater.

In areas without buoy moorings, many boat crews temporarily moor their vessels to reefs using steel cables (attached by rope to a vessel) that are looped around large coral

colonies or through crevices in the reef. This method, hereafter called ‘cable mooring,’ is used because the boat crews believe that it causes less physical damage to corals than anchoring. Whether this method of mooring is less damaging than anchoring remains unknown. Some stockholders, such as Ross McGrath, site manager of Red Sea Dive Safaris in Wadi Lahmi Bay, claims that the method is extremely damaging to corals on the reef edge and upper reef slope (pers. comm. December 2002).

Objective: To stop coral damage caused by anchors, anchor chains, and cable mooring.

Policy: Direct anchoring is prohibited on coral reefs. Mooring buoys will be made available to PA users in regularly used, permissible sites. All vessels in the PA must use mooring buoys when they are available. Eventually, no anchoring will be allowed where buoys are not present. Mooring maintenance will be an important component of the PAMU activities.

Action:

1. The PAMU/EEAA will implement the Mooring Buoy Strategy.³
2. The PAMU/EEAA will install moorings at frequently used reefs within permissible zones.
3. The PAMU will undertake random boat patrols to assess compliance with regulations pertaining to mooring use and no-anchoring.⁴
4. The PAMU, in consultation with boat operators and the Coast Guard, will implement a strategy to regulate the number of vessels permitted to visit popular dive locations per day within the PA.⁵
5. The PAMU will regularly inspect mooring buoys and arrange for their maintenance.
6. EEAA will undertake a study to assess the ecological effects of cable mooring.

Indicators:

1. Number of moorings.
2. Number of infringements relating to mooring use.

³ PSU Hurghada has recently submitted a mooring buoy strategy.

⁴ It is important that tourist boats use the buoy moorings, rather than continue to cable moor, and that the moorings are used appropriately. Patrols by EEAA rangers or community rangers will be required to ensure compliance.

⁵ At some popular reefs, there is an insufficient number of moorings to meet demand. Therefore, boats must either tie up to moored vessels, which may damage the mooring, or they will cable moor directly to the reef. Controlling vessel numbers at popular reefs will be difficult, at least in the short term, because many vessels operating in the PA are based in Hurghada and Safaga. However, it may be achievable with Coast Guard assistance, because day and safari vessel operators must provide the Coast Guard with their trip itinerary.

Boat Groundings

About 20 vessels run-afground every year on reefs in the Egyptian Red Sea (A. Afifi, Red Sea PAs Regional Office). These vessels range in size from small wooden fishing boats (<6 m) to bulk carriers. The presence of an ever-increasing number of recreational boats in the Red Sea coastal environment means that increased risks to fragile marine ecosystems can be expected. Boat groundings are frequent in intensively used parts of the Red Sea, such as around Hurghada. Damage to the coral reefs can be extensive. The lack of (or reluctance to use) proper navigational equipment, combined with poor vessel conditions, and low navigational skills probably contributes to the current level of incidents.

Objective: To minimize risk to human life and damage to corals by boat groundings.

Policy: Establish a marine environment where proper navigational and boat safety procedures are followed.

Action:

1. EEAA will review navigational requirements and aids for all vessels operating in the PA.
2. Inform boat operators of the risks and costs coral reef damage represents.

Indicators:

1. Number of boat groundings

Marine Tourism Activities

Impacts associated with the activities that tourists undertake during a visit, such as reef walking, boating, snorkeling, and SCUBA diving can be a chronic source of disturbance to corals and other benthic organisms and could result in localized physical destruction of corals, even under low levels of use.

The effects of diving, in particular, have been well described in Egypt (Hawkins & Roberts 1992, 1993, Jameson *et al.* 1999) and other regions of the world. Divers, snorkelers, and reef walkers can damage corals and other marine organisms through direct physical contact with their hands, body, equipment, and fins. Although, most divers make physical contact with the seafloor during their dive, only a small proportion of divers damage coral. Talge (1990) reported that 90 percent of 206 Florida divers contacted the seafloor but only 2 percent caused discernible damage. In Australia, Roupheal & Inglis (1995) reported that 70 percent of 250 divers contacted the substratum, yet only 15 percent damaged corals. Damage usually resulted from divers inadvertently kicking corals with their fins.

Most damage caused by individual SCUBA divers is relatively minor. A single fin kick can crush or sever the tips of branching corals or abrade corals, but is unlikely to kill a large coral colony. Corals have an ability to regenerate tissue over small injuries and

recover quickly from the loss of apical branch tips. Meek (1982) and Kobayashi (1984), for example, reported broken tips of corals repairing within 2 months of injury. Nevertheless, physical damage can kill small colonies (Loya 1976) and repeated physical injury can impair the regenerative capacity of corals, potentially leading to colony mortality. There is some evidence that the cumulative effects of diving have modified the structure of fragile benthic assemblages (Garrabou *et al.* 1998, Hawkins *et al.* 1999).

Objective: Stop coral damage caused by SCUBA divers, snorkelers, and reef walkers

Policy: Deliberate touching, trampling, breaking, or collecting of all living and non-living marine material in the PA is prohibited.

Action:

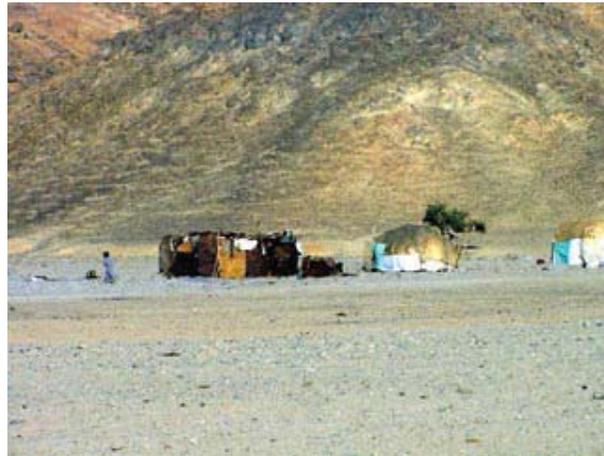
1. EEAA, in consultation with the Red Sea Diving Association and HEPCA, develop best-practice environmental guidelines to SCUBA diving, snorkeling, reef walking, and boating for distribution without cost to all Egyptian marine based-tourists operators.
2. EEAA implement a zoning scheme.
3. EEAA establish a baseline and monitoring program to assess the status of benthic assemblages in heavily used marsas in the PA.⁶

Indicators:

1. Number of indicator species at monitoring sites.
2. Condition of coral reefs at monitoring sites.

Indigenous People

Indigenous people include the coastal fishing communities and the Bedouins of the Ababda tribe inhabiting the desert regions of the park. Most of the local communities are extremely poor with little income earning potential. They also lack basic social services. At present, there is little local community involvement in or benefit from tourism. Few locals are employed in the hotels



Ababda settlement in WGNP

⁶ Marsas are uncommon features in the PA and may contain species or assemblages that are rare or absent in other marine environments along the Red Sea coast of Egypt. Marsas are some of the most frequently used areas in the PA because they provide access for divers and snorkelers to deep water and provide safe mooring areas for tourist vessels.

and related businesses. Some Bedouins are living off the garbage from the tourism resorts.

Local people are an integral component of WGNP; they have an intrinsic right to continue their traditional lives in WGNP and to benefit from its natural resources. The welfare and prosperity of these people must be of primary concern for the future management of WGNP. Although local people can contribute to the deterioration of natural resources of WGNP, they are in fact a primary stakeholder who should participate in a significant way in enhancing and benefiting from these resources in the end. No management plan will be successful and sustainable without the full participation and support of the indigenous people.

Objective: Ensure maximum benefit to indigenous communities from WGNP support of its management objectives.

Policy: Develop initiatives to involve the local communities in WGNP and ensure benefit-sharing from activities arising within it.

Actions:

1. Regular consultations should be maintained with indigenous community representative, such as tribal leaders (sheikhs).
2. The PAMU should seek to employ locals as community guards in the park. These people can also provide services such as assisting with waste management and trail maintenance.
3. The PAMU should stipulate that locals be employed in the businesses and facilities operating inside the park. Among the potential jobs, locals can work as tour guides and operate excursions such as camel trekking. Locals can also provide fish and meat and other goods and services.
4. Local community handicraft programs can be developed based on traditional crafts such as rug weaving. More innovative handicrafts and other natural products could be developed using local materials, such as jewelry from gemstones, sale of minerals and stones, carvings from granite, and healthcare products from talcum and medicinal plants.
5. Through the Social Fund for Development Fund (SFD), grants can be provided to the local communities for development of community businesses, such as community operated cafeterias and eco-lodges.
6. In cooperation with tour operators, initiate a program to train suitable indigenous people as tour guides.
7. Locals could also operate wildlife attractions such as feeding and drinking stations.
8. The PAMU will seek to establish a basic health monitoring system for local people, providing basic medication (through a trained medical ranger), and transferring more serious cases to nearby hospitals.

Indicators:

1. Average annual income of local inhabitants.
2. Health status of indigenous people.
3. Number of local people supporting WGNP.

Abuse of Cultural Heritage

Tampering with antiquities is a problem in most of the remote cultural heritage sites in Egypt. Uninformed tourists contribute significantly to the degradation of archaeological resources through trampling sensitive sites or collecting seemingly worthless artifacts. The rather indistinct nature of some archaeological sites (particularly prehistoric sites) might render them susceptible to damage as they can be easily overlooked and consequently overrun.

Intentional theft of artifacts is also widespread. Vandalism and haphazard quarrying and mining are other major threats. The Nuclear Materials Authority is targeting the Roman emerald mines in Nugrus and Sikait for possible extractive operations in the future.

Objective: Stop the deterioration and loss of archaeological resources in WGNP and adjacent areas.

Policy: All tampering, excavation, or collection of any material from or near known or potential archaeological sites (including historic mines) is prohibited. Only excavations sanctioned by the Higher Council of Antiquities will be permitted. Sensitive sites (identified in Appendix 16) will have controlled visitor access, while less sensitive sites will be open to visitors with appropriate precautionary measures taken.

Actions:

1. A map of known archaeological sites in WGNP shall be prepared and updated.
2. Sensitivity of sites will be evaluated and visitor management recommendations provided by experienced archaeologists (see Appendix 16 for site sensitivity and management recommendations).
3. PAMU will establish close contact with the Supreme Council for Antiquities (SCA) and the local antiquities inspectors in Marsa Alam to coordinate efforts.
4. PAMU/EEAA will establish close contact with the Nuclear Materials Authority, Egyptian Geological Survey, and local quarrying authorities to inform them of PA restrictions and regulations.
5. PAMU will establish a code of conduct for tour operators and tourists and inform them of restricted sites.
6. PAMU will intensify patrolling of highly sensitive and regularly visited sites and organize patrols in such a way that they are unpredictable to users.
7. PAMU/EEAA will monitor primary sites to be established to assess visitor impacts.

8. Highly sensitive sites should be closed off with fencing or road obstacles, or by assigning local community guards.
9. Restoration of critically damaged resources by sanctioned professionals should be encouraged.
10. Mapping and documentation by sanctioned professionals should be encouraged.
11. PAMU/EEAA will prepare public awareness and education materials, and interpretive and instructional signs to visitors.

Indicators:

1. Number of damaged archaeological site (number of incidents).

Solid Waste

Solid waste is a significant and visible problem in the coastal part of WGNP and its adjacent zone. Solid waste in the region is largely generated from tourist development nearby; some comes from marine traffic disposal of waste. Solid waste affects coastal vegetation and especially affects mangrove communities, which tend to act as traps for flotsam that can accumulate in great quantities.

A landscape strewn with garbage in a PA suggests poor management and this lowers visitors' regard for and appreciation of the landscape and its natural resources, especially if they have paid to enter the park and expect waste management to be provided as a visitor service.

Objective: To reduce solid waste inside and around WGNP.

Policy: Solid waste management inside WGNP must be a high priority for the PAMU. The general policy will be



This haphazard dump, inside the PA, belongs to an existing hotel and is contributing to the contamination of Wadi el-Gemal

to prohibit the dumping of all waste inside the PA. All visitors to backcountry areas must carry out their solid waste and dispose of it appropriately. The PAMU will seek to support local City Councils with domestic waste management within the PA and its Buffer Zone. Tourism facilities (including hotels, eco-lodges, and boats) operating within WGNP and its Buffer Zone should take full responsibility for disposing of their waste appropriately. Violators must be prosecuted rapidly.

Actions:

1. Establish close cooperation with TDA, city councils, and tourism developments and operators and encourage them to reduce the waste stream through recycling, separating organic waste at source, and promoting a reduction in packaging and use of plastic bags.
2. Identify and designate suitable sites for sanitary landfills and borrow pits within the Buffer Zone (partly achieved).
3. Ensure all waste is disposed of at designated landfill sites.
4. PAMU will install garbage bins at commonly used recreational sites along the coast within WGNP and ensure regular disposal of garbage. Bins will be placed out of sight. No bins will be placed in backcountry desert areas. Visitors there will be expected to pack out their own garbage (partly achieved).
5. Strict instruction must be given to boat operators not to dump waste in the marine environment, and encourage them to report offenders.
6. Raise awareness among tour boat operators and visitors about the importance of disposing of garbage responsibly and packing out garbage from backcountry areas.
7. Conduct cleaning campaigns with the assistance of local businesses and indigenous communities.
8. Prohibit burning of waste and roadside dumping of rubbish.
9. Enforce the dumping of all building debris and spoil in abandoned quarries in designated localities outside the PA or in its Buffer Zone.
10. Include waste management as a major prerequisite before approving any future investments in the PA Buffer Zone, or in the Ecotourism Zones.
11. Enforce immediate prosecution of offenders.

Indicators:

1. Number of clean beaches.
2. Number of desert shrubs free of garbage in sample wadi areas.
3. Number of waste items on sample beach lengths.

Ship-originated Pollution

Lintner *et al.* (1995, cited in PERSGA 2001) reported that 25,000–30,000 ships pass through the Red Sea annually. Evidence of illegal dumping of oily substances can be found throughout the PA (Hassan 1998). This includes weathered crude oil on beaches and oil-stained rocks. Gomma (2001) suggested that Marsa Ghalib Harbor is a chronic source of spilt fuel for areas south of it. However, it remains unknown whether the source of spills is associated with the fuelling facility or with discharged ballast water. Captain Sherif Fawzy, Manager of Marsa Ghalib Harbor, suggests that the main source of petroleum hydrocarbons into the harbor is associated with discharged generator cooling water. However, this is unlikely given that the cooling water typically does not

make contact with oil or oily substances. P. Jones, Manager of the Gouna Harbor north of Hurghada, suggested that discharge of oily bilge water is exacerbated in Egyptian Red Sea waters because the wooden tourists vessels are not structurally sound, leak constantly and, thus, oily bilge water is frequently pumped into the sea (pers. comm. January 2003).

The Red Sea Governor's Decree 115/2000 states that all boats staying out at sea (overnight) must have waste holding tanks and waste munching machines. However, there are no harbors in the PA with facilities to receive and dispose of sewage. Consequently, regulations have been issued that vessels within Egyptian waters must not discharged within 5 km of the reef edge or the coastline (Abdalla Selim, EEAA, pers comm. February 2003)



Much of the garbage in this Lahmi Bay mangrove colony probably originated from tourist boats

Safari and daily boats are also a chronic source of solid waste, including plastics, to the marine environment. Most stakeholders in the PA reported anecdotal evidence of safari boats discarding solid waste directly into the sea. Reasons for this include the smell of the rubbish and the space it takes up. Derraik (2002) reviewed the effects of plastic debris on marine species and concluded that a large number of marine species are known to be harmed and/or killed by plastic debris. Marine animals are mostly affected through entanglement in and ingestion of plastic litter. Other less known threats include the use of plastic debris by “invader” species and the absorption of polychlorinated biphenyls from ingested plastics (Derraik 2002).

Objective: Ensure that vessels operating in and around WGNP do not degrade the environmental quality of the PA through intentional or unintentional introduction of pollutants or waste.

Policy: No discharge of liquid or solid waste will be allowed from vessels in or adjacent to the PA. All vessels must dispose of waste at port. Appropriate facilities to receive and treat boat waste (both solid and liquid) should be developed at known sites on the periphery of the PA. Only vessels of good operational condition should enter the PA.

Action:

1. The PAMU will conduct regular patrols to ensure that vessels operating in the PA are not disposing of liquid or solid waste, and that vessels are not producing oily discharge.

2. The EEAA and other concerned stakeholders will establish waste collection facilities at ports and marinas in the region.
3. The PAMU will inform stakeholders of PA regulations.
4. The PAMU/EEAA will coordinate with stakeholders to ensure that existing and future harbors are supplied with liquid and solid waste disposal facilities.

Indicators:

1. Number of violations.
2. Number of ports with waste disposal facilities.
3. Number of waste items on sample beach lengths.

Sewage

There are no approved sewage outfalls in the PA. New resorts are required to have treatment plants. Treated water is used for irrigation and the sludge is disposed of in the desert, sometimes used as fertilizer. Septic systems are still commonly used and may contaminate groundwater aquifers or the adjacent reef flat environment. However, no data have been collected to test this prediction. Hamata and Abu Ghusoon, the largest centers of population adjacent to the PA, are still on septic systems. In addition, although resorts are required by law to have treatment plants and not to discharge sewage or treated water back into the sea, some hotels are still on septic systems.

Objective: Sewage generated in the PA and its Buffer Zone will have minimal effect on the environmental quality of the PA and its biota.

Policy: No discharge of sewage into the sea or on land. All sewage will be treated. Within the Buffer Zone, sludge can be used as fertilizer, otherwise it will be disposed in designated landfills outside the PA. No new septic trenches should be allowed, and the effect of existing ones should be assessed.

Action:

1. The PAMU will undertake a study to assess the impact of septic systems on adjacent coastal waters in WGNP.
2. The PAMU will patrol new resorts to ensure the developers comply with their licenses governing the treatment and disposal of sewage.

Indicators:

1. Levels of pollutants in areas where septic systems are anticipated to have an impact on adjacent coastal waters in WGNP.
2. Number of new resorts and other infrastructure with operational treatment plants.

Major Oil Spill Risk

The risk of a major pollution event due to an accidental oil spill in the PA is high given the volume of commercial shipping that passes through the Red Sea. An oil spill in or adjacent to the PA would not only have detrimental effects on water quality but could also have significant ecological impacts on birds and intertidal assemblages. The EEAA is responsible for coordination of oil spill incident response and remediation (Borhan 1998). While the management of shipping is outside the scope of this Plan, the preparation for an incident is not. Dr Mohamed Borhan, Director General of the Egyptian National Oil Spill Contingency Plan, suggested that the risk of environmental damage associated with a spill is high given the incomplete knowledge on the spatial distribution of sensitive habitats in the PA and the current lack of spill control equipment (pers. comm. January 2003).

Objective: Reduce the risk of an oil spill causing significant impact to the PA.

Policy: Increase preparedness to deal effectively with any potential major oil spill in the PA.

Action:

1. Red Sea PA Geographic Information System (GIS) Unit provide EEAA/NSCP GIS Office with maps of mangroves and other sensitive habitats in WGNP.
2. EEAA develop a contingency plan to combat an oil spill in the PA.
3. EEAA establish a rapid oil spill response storehouse at El-Quseir or Marsa Alam that would hold suitable equipment to combat a three-tier size spill.⁷

Indicators:

1. Number of oil spills reaching land.
2. Development of an oil spill contingency plan for the PA.

Charcoal Making

Charcoal production is one of the few traditional cash products available to inhabitants of the region. This is a process by which the wood, mostly of



Charcoal making by local people, Wadi Halous, WGNP

⁷ Dr Borhan, EEAA/NSCP Unit, has said that this is prohibitively expensive now. A modern oil spill contingency depot was established at Sharm el-Shiek with funding from a major oil company.

Acacia trees, is transformed into charcoal through anaerobic combustion. Acacia trees are the backbone of the cultural landscape over much of the Eastern Desert (Krzywinski & Pierce 2001). Traditionally, only dead trees and branches have been used for charcoal production. Due to increased economic demands on local people and a shrinking resource base, live branches or even whole trees are sometimes cut down to provide for charcoal making. The activity is widespread in WGNP, but there are no figures available to indicate the precise magnitude of the problem. Much of the charcoal is destined for the Nile Valley and tourist resorts for use in smoking 'shisha.'

The economic return from charcoal making is meager for the average Egyptian; however, it is probably significant for the local inhabitants, as cash products are extremely limited. On the other hand, the ecological impact of reducing the number of trees in this arid environment is extremely high. Tree fecundity is low and it takes many years for trees (under normal conditions) to reach mature sizes.

Objective: To ensure that charcoal production does not affect the natural population dynamics of native woody vegetation and its ecological functions in WGNP.

Policy: Charcoal production is contradictory to WGNP's designation as a National Park and should be stopped in the medium-term future (next 5 years). Since this is a traditional commercial activity on which the indigenous community relies as a relatively important source of income, alternative income sources should be provided before a complete ban on charcoal production is enforced.

Actions:

1. Initiate a specialized study to assess the current impact of charcoal production and the possibilities of eliminating this activity in WGNP, identifying the likely socio-economic and ecological consequences.
2. Implement a phased approach leading to a complete ban on charcoal production in close consultation with local community leaders and members.
3. Initially ban the activity from Strict Natural Zones, followed by a ban in Premium Wilderness Zones.
4. The PAMU will seek to find alternative activities for affected families through employment as community guards (other ideas are listed above, under "Indigenous People").
5. Inform and explain to the local inhabitants why charcoal making is being stopped.
6. EEPP/PAMU will patrol to control charcoal making in non-designated zones.

Indicators:

1. Amount of charcoal produced.
2. Number of trees/tree branches felled for charcoal production.

Fuel Wood Collection

Wood is collected by indigenous people as a source of fuel. Dead wood is preferred, but the lack of it leads locals to break tree branches and leave them to dry so they could be used later for fires. Unlike the production of charcoal, small branches and twigs are used for fires, and breaking of living trees occurs on a much smaller scale, making the impact of this activity of less significance. Native inhabitants of WGNP have an inherent right to use the resources of their land, and they have done so mostly in a sustainable fashion for millennia. However, with the growth of the indigenous population, and increasing numbers of tourists, campers, and workers, all of whom tend to collect excessive amounts of wood to supply their campfires, the pressure on woody plants is becoming excessive.

Wood is an important resource in the desert. It is important for the livelihood of the local community, but also plays an important ecological role. Even dead wood is an important component of WGNP's terrestrial ecosystem. Dead wood is home to whole communities of detritus organisms that consume wood and hide in wood debris. These creatures represent an important (though forgotten) component of the biodiversity of the region and play an important role in the ecology of the region.

Objective: To reduce the impact of fuel wood collection on wild flora of WGNP and adjacent regions, and ensure its sustainability.

Policy: Only indigenous inhabitants will be allowed to collect fuel wood. Visitors must obtain fuel from other sources, such as gas cylinders. The PAMU will seek to prohibit the collection of fuel wood for all visitor activities in WGNP and to stimulate demand for alternative fuels. Use of solar technology and other renewable energy sources should be encouraged, particularly in eco-lodge developments and by the military.

Actions:

1. Prohibit the use of fuel wood by non-indigenous users of WGNP, through awareness and enforcement.
2. Inform tour operators and other visitors that they should bring their own supplies of imported fuel wood, butane gas cylinders, or kerosene stoves.
3. Produce awareness materials on the threat of fuel wood collection to biodiversity.
4. Hold workshops for stakeholders engaged in tourism businesses to increase awareness of the regulations governing use of fuel wood and alternatives to wood as fuel.
5. Monitor the impact of implementing the above measures on fuel wood consumption.
6. Establish a pilot venture to import fuel wood from the Nile Valley for sale to visitors to WGNP.
7. Design, test and manufacture simple solar stoves for demonstration purposes, with the aim of generalizing their use by indigenous inhabitants of WGNP (use experience gained in St Katherine PA).

Indicators:

1. Number of visitors using native fuel wood.
2. Condition of vegetation in monitoring plots established near local settlements.

Grazing

Localized overgrazing is one of the main problems in WGNP. However, until alternatives such as affordable feed supplements are available, the problem will remain intractable, as grazing is a long-standing cultural tradition linked directly to one of the most important livelihood sources of the local communities.

Camels regularly feed on mangroves in WGNP. Some stands show evidence of significant grazing pressure such as 'grazing lines' on tall trees and cropped foliage cover on smaller trees. Dead adult mangrove trees were observed at the Hamata stand located close to the Red Sea Diving Safari Camp at Wadi Lahmi. However, the cause of mortality remains unknown. The long-term effects of grazing and trampling of mangrove stands and other vegetation types remain unknown. *Propagules* are likely to be trampled by camels and soil compacted. Distinct camel and human tracks were clearly evident in mangrove stands and the *Zygophyllum* communities near the Qulan Village.

Objective: To ensure that grazing pressure is maintained at sustainable levels.

Policy: The PAMU, with the co-operation and agreement of local communities, will seek to introduce an integrated program for sustainable grazing, particularly in critical habitats, such as mangroves and salt marshes.

Actions:

1. Establish close communications with local community members to understand grazing patterns and issues.
2. Conduct a study to assess the impact of grazing on the natural vegetation of the region, including mangroves.
3. Grazing in mangroves should be restricted to Traditional Use Zones only.
4. Grazing will be prohibited in Strict Natural Zones.
5. Patrol to enforce no grazing zones.

Indicators:

1. Number of goats in selected monitoring sites.
2. Number of camels in selected monitoring sites.

Fishing

Indigenous and itinerant commercial fishermen fish in the PA using a variety of methods. The intensity of fishing efforts and their effect on local populations of target and by-catch species remains unknown. However, fishermen at the Qulan Village

reported that local fisheries resources have diminished, and that they were forced to travel greater distances to seek new fishing grounds. Other studies have indicated that Bedouin fishermen can have significant effect on local fish stocks. Galal *et al.* (2002) reported that fishing by Bedouins in Nabq PA, had led to a significant decrease in the abundance and mean length of some *serranids* and *lethrinids*. The long-term effects of human induced change in the composition of reef fishes or modification of trophic structures remain unknown. Long-term studies suggest that the loss of herbivores can contribute to shifts in the composition of sessile benthic organisms.



Fishermen from the Nile Delta cause considerable damage to coral reefs

Barrania & Ibrahim (2003) reported that non-indigenous fishermen in the PA have introduced gill nets named 'sabeeb' that have smaller mesh sizes than those legally permitted. They also use ring nets on corals that can lead to physical destruction of this habitat. Riegel & Luke (1997b) reported evidence of widespread use

of explosives in and adjacent to WGNP in the past. Explosive fishing kills non-target species, including corals and other habitat-forming species. It remains unknown whether explosive fishing is still done in the PA. Rangers reported that very small numbers of fishermen may still use explosives in the region of Marsa Alam, but that the practice is no longer widespread (EEAA Rangers, Marsa Alam, pers. comm. 2002).

Objective: To establish sustainable and ecologically sound fisheries in the PA.

Policy: Reduce current level of fishing activity in the PA through limiting fishing rights to indigenous fishermen only, and reduce ecological damage through prohibition of illegal fishing methods and establishing no-take zones.

Action:

1. The PAMU/EEAA and the Fisheries Authority will establish and implement a fisheries management plan for the PA (in progress).⁸
2. The PAMU will establish and implement a PA zoning scheme that will include no-take zones.
3. The PAMU will implement a gradual phasing out of non-indigenous fisherman active in WGNP.
4. All fishermen active in WGNP will need to be licensed by the EEAA and registered with the PAMU. Licensees will be given clear instructions on the regulations for fishing in the PA and details of no-take zones.

⁸ Dr A. Barrania and Dr A. Ibrahim recently submitted to PSU Hurghada a fisheries management strategy for the PA (Barrania and Ibrahim 2003). EEAA and the Ministry of Agriculture should review this, and ensure the appropriate recommendations are implemented.

5. The PAMU will carry out an information and educational campaign to alert fishermen, fisheries authorities, and Coast Guard active in the WGNP region to the PA regulations.
6. The PAMU will patrol the PA waters and prosecute repeat violators of regulations.
7. The PAMU will monitor fish landings in and around WGNP.

Indicators:

1. Fish landing statistics in and around WGNP.
2. Population structure of commercial species.
3. Number of operational no-take zones.

By-catch and Boat Strikes

Dugong and turtles are vulnerable to being caught and drowned in large mesh (150 mm and greater) fishing nets, and being hit by fast moving boats. The frequency of such occurrences in the PA and in other areas of the Egyptian Red Sea remains unknown. During their field survey along the Egyptian Red Sea in March 2003, Barrania and Ibrahim (2003) photographed marine turtles caught in fishing nets on several occasions.

Objective: Limit the impact of human activity on dugongs, marine turtles, and cetaceans in the PA.

Policy: Ensure that fishermen and boat operators active in the region are aware of the risks posed to dugongs, marine turtles, and cetaceans, and of the complete protection they enjoy inside the PA. Prohibit vessels from speeding in important habitats and locations. Ban the use of all sporting speedboats in the PA.

Action:

1. The PAMU identify critical habitat for dugongs and marine turtles in the PA.
2. The PAMU develop strategies to minimize disturbance to and mortality of dugongs and marine turtles in the PA.
3. The PAMU inform fishermen and boat operators active in the region of the complete protection dugongs, marine turtles, and cetaceans enjoy in the PA.
4. The PAMU implement the zoning scheme.

Indicators:

1. Number of turtle and dugong caught by fishermen in WGNP.
2. Number of turtle, dolphins, and dugong injured by vessels in WGNP.

Collection of Marine Invertebrates

Since about 1999, the trade and selling of marine curios such as corals and shells has been greatly curtailed in Hurghada, Safaga, Quseir, and Marsa Alam. This has been

achieved through enforcement of laws restricting the harvesting of these products. However, large numbers of dead and broken Lambis shells in the PA indicate these are still heavily harvested (T. Roupahel, PSU, pers. comm. June 2002). The animal is harvested for its meat, but the scale of harvesting remains unknown. The meat is frequently sold commercially (dried) in some Red Sea urban centers, e.g. Suez.

About 50 species of sea cucumbers (*Holothuriidae*) are known from the Red Sea. Rampant poaching and over harvesting by licensed fishermen have lead to the commercial extinction of the most commercially valued species (M. Hanafy, PSU, pers. comm. January 2003). The status of all species in the PA remains unknown. The long-term ecological consequence of reduced numbers of benthic feeding sea cucumbers from the region is difficult to predict. Uthicke (2001) described sea cucumbers as benthic recyclers and suggested that the presence of high densities of these animals can stimulate the production of the microphytobenthos. Recovery of decimated populations may take many decades, particular for species heavily reliant on asexual reproduction, to maintain abundances (Uthicke, Australian Institute of Marine Science, pers. comm. February 2003). Further, he does not advocate relocation of *holothurians* to overexploited fishing rounds unless genetic studies show that the relocated specimens are of the same genetic stock.

Objective: To maintain the natural population levels and ecological functions of marine invertebrates in WGNP.

Policy: No collection of marine invertebrates will be allowed in WGNP. As the long-term ecological damage from this activity is very high, with limited socio-economic consequence and clearly contradicts the PA objectives, the ban on invertebrate collection should be immediately effective.

Action:

1. The PAMU/EEAA and the Fisheries Authority will coordinate efforts to enforce the ban on invertebrate collection in WGNP.
2. The PAMU will carry out an information and educational campaign to alert fishermen, fisheries authorities, and Coast Guard active in the WGNP region to the PA regulations.
3. The PAMU will patrol the PA waters and prosecute repeat violators of regulations.

Indicators:

1. Number and species of marine invertebrates found with violators.
2. Number of violations.
3. Numbers of indicator species in specified monitoring plots.

Collection of Medicinal Plants

The medicinal plants found in WGNP are a valuable resource for local people. *Balanites* and *Salvadora* are two of the most valuable medicinal plants in WGNP. The collection of *Balanites* fruits, and *Salvadora* branches and roots is a source of cash for the local population. However, if unregulated, this activity could lead to the degradation of the plants and affects their regeneration. In the meantime the income received by local people represents a fraction of the true value of their products.

Objective: To ensure that medicinal plant collection is sustainable and the income to indigenous communities is maximized.

Policy: Best practices for the collection of medicinal plants that ensure sustainability should be applied. Collectors will be encouraged to process, package, and market their own medicinal plants. PAMU will assist in facilitating marketing avenues.

Actions:

1. Build consensus for a community agreement on sustainable collection levels for medicinal plants from WGNP.
2. Develop best practices for medicinal plant collection. The collecting system should be based on traditional indigenous conservation traditions.
3. Developing a marketing strategy for medicinal plants from WGNP.
4. Encourage the GEF/United National Development Programme (UNDP)/EEAA Medicinal Plants Project, which aims to establish sustainable harvesting practices for wild medicinal plants several PAs in Egypt, to assist and participate in developing the above activities.
5. Encourage collectors to process, package, and market their own medicinal plants to add value to their product.
6. Introduce a system for licensing collectors.
7. Establish a local branch of the Medicinal Plant Association.

Indicators:

1. Number/cover of medicinal plants in monitoring plots.
2. Income from medicinal plant units.

Hunting

Hunting is a serious threat to large mammals in the region. Already Dorcas Gazelle *Gazella dorcas* have declined notably in much of the area, particularly the coastal plain, due to excessive hunting. Catching and trapping of Nubian Ibex *Capra nubiana* at watering holes is also a serious problem, in this and other regions of the Eastern Desert. Most seriously threatened is the Barbary Sheep *Ammotragus lervia*. Although most of the hunting is done by sports hunters from the Nile Valley, foreigners as well as army personnel and locals trap wildlife for food. But this is not a significant source of food.

Commercial wildlife collectors (particularly reptiles) are often active in various parts of the Eastern Desert, mainly to supply the international pet trade. The Oscillated Dab Lizard *Uromastyx ocellata* is one of the primary target species for collectors. Occasional falcon trapping is also known to take place along the Red Sea coast during autumn. Lanners *Falco biarmicus* and Sooty Falcons *F. concolor* are two native species that have suffered from this destructive activity.

Objective: To maintain the natural population levels and ecological functions of wildlife in WGNP.

Policy: Stop all hunting and wildlife collection activities in the PA. The no-hunting regulations within the PA and its Buffer Zone will be strictly enforced for all wild native species (this excludes catching commercial fish), and offenders will be vigorously prosecuted.

Actions:

1. EEAA/PAMU will make frequent patrols of important wildlife locations and habitats. Special note should be given to securing water holes and wells, where wildlife might concentrate to drink or hunt.
2. EEAA/PAMU will mobilize community guards' interventions and liaison activities in those areas and in seasons when hunting (trapping and collecting) is reported.
3. EEAA/PAMU will develop vigorous interpretation program aimed at local people, explaining wildlife's ecological importance and the charismatic value of native wildlife, especially large mammals and particularly predators, for PA visitors.
4. EEAA/PAMU and TDA will expand eco-tourism destinations to remote areas to offer alternative income generation opportunities.
5. At the local level, community guards should take note of animal collection or hunting activities, as local participants are usually involved.
6. EEAA/PAMU will install clear signs that indicate that wildlife hunting is strictly prohibited in the PA and its Buffer Zone.

Indicators:

1. Number of selected indicator species at designated monitoring sites (Gazelle and *Uromastyx* are good indicator species, others need to be identified).

Mining and Quarrying Activities

Mining and quarrying activities in the WGNP have been developed with little concern for the environment and the landscape qualities of the region. However, they have impacted only a limited area of the landscape to date. There are few regulatory mechanisms in place to assure environmental quality in future operations, which are likely to continue on a limited basis. The lack of such management tools is putting the resources of the region at jeopardy. Quarrying has huge negative impacts on the environment. It causes aesthetic impacts; damages vegetation and soil, leading to reduced

grazing, increased soil erosion and flooding; and reduces wildlife populations and habitat complexity. Quarrying and tourism are incompatible. Quarrying must be a strictly localized activity while tourism should be an extensive activity to maximize economic returns. The geological resources contained within the PA are their basic fabric and the existence of exploitable geological resources should not necessarily mean that they are available for exploitation. It may be necessary to forgo the immediate exploitation of such resources in the interest of environmental conservation and for the sake of future generations. Recently the World Parks Congress (Durban 2003) indicated, among its resolutions, the incompatibility of mining and quarrying activities with protected areas objectives.

Objective: To seek to minimize quarrying and mining activities in WGNP and to ensure that existing activities do not destroy the long-term value of the PA's natural resources.

Policy: Quarrying for ornamental rock or building material are by their very nature consumptive activities, which can never be sustainable, and are therefore inimical to PA objectives. Law 102/1983 expressly forbids damaging or removing rocks or soil and the spoiling or destruction of geological



Granite quarrying is a non-sustainable activity, which leads to significant landscape scarring

structures. Therefore, the PAMU will limit and reduce current

mining and quarrying to the minimum, and will seek to stop all mining and quarrying for non-strategic materials that are found outside the PA by 2007. All quarrying and mining activities will be immediately prohibited in important wildlife habitats, premium tourist areas, areas of natural beauty, and archaeological, cultural, and religious sites.

All quarrying and mining activities within the PA will require approval and licensing from the EEAA. No licenses will be given outside designated zones, within the Multiple Use and the Buffer Zones. Licenses will only be given after field evaluation and inspection of potential sites by PAMU staff. In the meantime, the PAMU will seek to restore old quarry sites by promoting the utilization of granite waste and re-profiling sand and gravel borrow pits and spoil tips.

Actions:

1. Identify mining and quarrying areas in WGNP, and the operational/contractual condition at each.
2. Liaise with the Red Sea Quarry Department to stop all granite quarrying activities, until permissible quarrying localities are identified on the ground, and sustainable quarrying techniques agreed upon.

3. The PAMU, in consultation with the Red Sea Quarry Department and the Egyptian Geological Survey, will institute and enforce new regulations for the issuance of operator licenses, which specify codes to increase efficiency, reduce wastage, and minimize environmental impacts.
4. On the basis of commercial, environmental, and aesthetic considerations, the PAMU, in cooperation with the Red Sea Quarry Department and the Egyptian Geological Survey, will define areas where quarrying activities are to be allowed within the Multiple Use and Buffer Zones of WGNP. No quarry activities will be permitted outside these defined quarry zones.
5. The PAMU will ensure that regular monitoring of all active quarry sites is implemented.
6. The PAMU will ensure that operators are kept fully aware of quarry regulations.
7. The EEAA will help initiate projects to introduce efficient, modern methods of quarrying and mining that reduce waste in the industry.
8. The EEAA will promote the exclusion of all commercial mining and quarrying activities from within the PA when there are alternative sources of supply outside PAs.
9. The PAMU will seek to restore the landscape at stopped quarry and mine sites in exposed localities (as a priority), such as at Wadi Shawab and in the vicinity east of Gebel Hamata.
10. The PAMU will initiate a program to reclaim and utilize granite debris at stopped quarry sites in exposed localities (as a priority), such as at Wadi Shawab and in the vicinity east of Gebel Hamata.
11. Reasonable concession fees should be collected for each license for the benefit of the PA Fund.

Indicators:

1. Number of active mines and quarries.
2. Number of degraded mining and quarry sites.
3. Maximal distance from quarry or mining site center where soil disturbance can be observed.

Threatened Species

WGNP is home to a number of globally (as well as nationally) threatened species of fauna. The conservation of these threatened species is an international obligation and one of the priorities of the National Biodiversity Strategy and Action Plan. The most outstanding threatened species in need of urgent management effort include desert antelopes, marine turtles, birds of prey, dugongs, and nesting seabirds (see Table 9 for a complete listing of globally threatened species).



The Lappet-faced Vulture *Torgos tracheliotus* is a globally threatened species (Vulnerable) according to the IUCN Red List (2002)

Objective: To ensure the long-term *in-situ* survival of the globally threatened species found in WGNP at their natural densities.

Policy: Globally threatened species found in WGNP represent a critical resource in need of constant monitoring and special management effort.

Actions:

1. The PAMU will seek to establish monitoring programs to establish the conservation status and population sizes of the most critically threatened species (Dugong, marine turtles, Barbary Sheep, Dorcas Gazelle, and Ibex).
2. The PAMU will establish Species Action Plans for the above-mentioned species.
3. The PAMU will conduct regular patrolling of critical habitats and locations for the above-mentioned species.
4. The PAMU will establish scientifically rigorous monitoring programs for the above-mentioned species.

Indicators:

5. Number of individuals of target species at designated monitoring sites.

Localized and Threatened Habitats/Locations

Some habitats are particularly vulnerable because they occupy very small areas and/or are naturally sensitive to disturbance. These include habitats or locations that are very small, such as marine islands, mangrove stands, turtle nesting beaches, and sensitive archaeological sites. A high degree of existing or anticipated human use (for recreation for example) at these sites, and the potential for conflict is an important factor in identifying sites of special concern.

Humans have the potential to disturb nesting marine turtles and seabirds. People walking or campfires may deter female turtles from nesting. Large pieces of solid waste, such as pallets or large lengths of timber, on nesting beaches may act as barriers to nesting turtles. Similarly, humans walking in or adjacent to an active rookery may alter the behavior of adult birds to the detriment of the young. Introduced animals, such as rodents or cats, may prey on eggs, recently hatched birds, or on adult birds.

The intensity and frequency of human visitation to islands in the PA remain unknown. Old campfires, considerable amounts of solid waste, and fishermen's shelters and tables are observed on some of the islands. Wadi Lahmi Resort offers day trips to the Qulan

Archipelago, where visitors explore islands such as Mahabis Island. The Wadi Gemal Dive Center infrequently takes birdwatchers to visit Wadi Gemal Island in spring and autumn. Mrs Kirsten Ehlert, manager of the center also suggested that human visitation to the island and the collection of bird eggs by fishermen has resulted in extensive mortality of eggs and young birds during the nesting season.

Objective: To ensure that sensitive habitats/localities found in WGNP retain their natural, ecological, or cultural values and functions.

Policy: Sensitive habitats and localities need particular management attention to reduce or eliminate the risks they face, case-by-case (e.g. most islands will be closed to visitors, while some will be subject to seasonal restrictions; turtle nesting beaches will be closed to visitors during the breeding season, and no structures will be permitted in their vicinity).

Actions:

1. The PAMU will seek to identify the most critical habitats and locations in need of special management input. A preliminary list includes the following sites: Wadi el-Gemal Delta, Sharm el-Luli, the turtle nesting site at Marsa Um el-Abas, Qulan and Hamata mangroves, the Qulan Islands, Wadi el-Gemal Island, and Nugrus and Sikait Roman mining villages.
2. The PAMU will establish Site Action Plans for the above-listed habitats and localities, and others, that are identified at later stages (see CMA Management Plan for pilot Site Action Plans).
3. The PAMU will conduct regular patrolling of critical habitats and locations.
4. The PAMU will establish scientifically rigorous monitoring programs for indicator resources at each of the above-mentioned localities.

Indicators:

1. Variable at each habitat/location. To be specified in each Site Action Plan.
2. Number of nesting turtles and seabirds at important nesting sites.

Introduced, Feral, and Invasive Species

Alien, invasive species are one of the most outstanding issues facing biodiversity today on a global scale. Along the Red Sea, alien species of plants are being widely introduced for landscaping in tourist developments. These alien plant species can become invasive. Feral cats and dogs associated with human dwellings can be highly destructive to native wildlife. Feral cats are particularly damaging to reptile and bird populations, while dogs are known to hunt and disturb gazelles. Both cats and dogs can transmit diseases to wildlife. Feral donkeys are also a problem because of the impact they have on vegetation and water supplies (one donkey has the nutritional maintenance needs of three male ibex).

In temperate marine systems, invasive species are well-documented causes of disruption within the marine community. Recent studies indicate that tropical seas are also susceptible to invasions from introduced species. For example, Eldredge and others (Dr. L Eldredge, pers. com. 2001) recorded 340 non-native marine and brackish water species from Hawaii. The majority of these species are thought to have been introduced through hull fouling. Invasive macro-algae species from the Mediterranean possess a potential threat to marine species in the Red Sea.

Three harbors in the PA regularly receive vessels from international waters. Species introduced to these harbors could conceivably spread into adjacent waters. Alien species of marine fauna are also used in mari-culture in various parts of the Red Sea.

Objective: To eliminate all introduced, feral, and invasive species from WGNP, and prevent the introduction of any further ones.

Policy: The PAMU will seek to eradicate, in a humane manner, all feral, alien, and invasive species inside WGNP. No poisons will be permitted for alien species control. Further introduction of alien, particularly invasive, species in WGNP will be prohibited.

Actions:

1. The PAMU will prepare a list of feral and alien species found in WGNP and record their distribution.
2. PAMU will undertake a biological survey of the harbors at Abu Ghusoon, Marsa Alam, and Hamata to describe the occurrence of introduced marine species, and assess possible eradication.
3. The PAMU will implement a humane eradication program for all alien species, including feral cats and dogs. Priority will be given to Strict Natural and Premium Wilderness Zones.
4. The PAMU will encourage local inhabitants to round up feral donkeys from Strict Natural and Premium Wilderness Zones.
5. The PAMU will prohibit the use of exotic plants for landscaping in all developments inside WGNP, and enforce the use of alternative indigenous species.
6. Establish a nursery of local indigenous plant species to be used in landscaping in WGNP. The World Food Program project in the southern Red Sea could assist in this effort.

Indicators:

1. Number of introduced species.
2. Number of individuals of feral/introduced species in designated monitoring plots.
3. Number of non-indigenous plant species used in landscaping.

Scientific Research

Although the PAMU is primarily a management body and not a research institution, effective conservation management requires accurate and relevant information. Thus, targeted and management issues oriented research is an important component of the PAMU's scope of work. Unplanned research lacking clear scientific objectives could be counterproductive and should be discouraged. Indeed some research can be highly damaging to important natural resources, especially if research design calls for the collection of large numbers of specimens of fauna and flora or other samples.

WGNP is a valuable scientific resource that will increasingly attract scientists and researchers and these should be encouraged. Scientific research is one of the important activities that PAs seek to promote and facilitate.

Objective: Ensure that all scientific research conducted within WGNP is not detrimental to critical natural resources, is scientifically and ethically justified, and helps advance the PA management objectives.

Policy: Meaningful, non-intrusive scientific field research is an important activity to be encouraged in WGNP. The PAMU will encourage and, where possible, support applied research both by outside researchers and by PAMU staff, according to planned priorities. Internal studies are the ones elaborated by the PAMU staff or financed by its administration to directly support the PAMU decision-making or management activities.

All external researchers must submit a detailed proposal to the PAMU/EEAA for approval. All data and research results are to be registered in the PAMU's Information Technology (IT)/GIS unit as a matter of course.

Actions:

1. The PAMU will prepare a schedule for priority research projects that the PAMU staff should carry out, or that can be contracted to external researchers.
2. All researchers must submit a research proposal for PAMU/EEAA approval, outlining their intended research and methodology and indicating whether specimens of plants are to be collected. If collection is envisioned, the researcher must tell how and in what quantities, with appropriate justification.
3. Outside researchers will be encouraged and supported, where practical, to undertake applied research on condition that they submit signed confidentiality and code of conduct statements and submit papers intended for publication for prior review.
4. All researchers will be expected to acknowledge any support and submit a free copy of any paper, article, or thesis arising from the research to the PAMU library.
5. The PAMU technical staff will be encouraged to pursue relevant and applied research as part of their duties.

Indicators:

1. Number of applied (i.e. management-oriented) research projects.

2. Percent of priority research topics addressed.
3. Number of reports and reprints resulting from the research received by the PAMU.

6. Management Tools

Zoning

An important mechanism to achieve the objectives of WGNP is a zoning scheme. The zoning scheme for WGNP is a resource-based approach by means of which the area is zoned, or classified, according to its need for protection; level or intensity of management; and capacity to sustain traditional, public, or commercial uses. The scheme provides guidelines for management actions and helps resolve conflicts that frequently arise when attempts are made to conserve and utilize the same resource base. It also designates areas for specific activities such as scientific research, recreation, tourism, or fishing. For example, recreation zones, Category II of the IUCN PA Categories, are reserved primarily for recreational activities, such as swimming, snorkeling, and diving. Table 10 lays out the nine zones in the WGNP scheme.

Table 10 Internal Management Zones, WGNP

Zone Name	Level of Management Input	Permissible Impact
1. Strict Natural Zone	Low–moderate	Zero impact
2. Premium Wilderness Zone 3. No-take Zone	High	Low impact
4. Recreational Zone 5. Archaeological Protection Zone 6. Traditional Use Zone	High	Moderate impact
7. Multiple Use Zone 8. Ecotourism Development Zone 9. Adjacent Area (Buffer Zone)	Moderate	Relatively high impact

The WGNP zones fall into four categories of varying protection levels, ranging from a strict natural zone, where no activities are permitted, to a multiple use zone, where many activities of limited ecological impact are allowed under strict management constraints. An external zone category will be applied to accommodate the PA adjacent area: Buffer Zone. Table 11 and Table 12 categorize the most common or anticipated activities in WGNP according to permissibility in each of the zones, whether terrestrial or marine. Map 15 shows the proposed zoning scheme for WGNP. An Arabic translation of this section can be found in Appendix 19.

The TDA developed a Land Use Management Plan (LUMP) for the southern section of the Red Sea (roughly between Marsa Alam and Ras Banas) with a depth of 5 km inland. This plan area overlaps to some extent with the WGNP area. Extensive effort was made by the TDA and EEAA to adjust and fine-tune the LUMP and this plan, so that they are compatible. The LUMP zoned TDA coastal area according to ecological sensitivity and provides detailed instructions and regulations to potential ecotourism development in

this area. The zoning scheme for the coastal area of WGNP in this plan coincides with that of the LUMP.

Zone Descriptions

STRICT NATURAL ZONE

General Description: Pristine natural areas set aside for the free interaction of ecological factors and worthy of total protection with no roads or other forms of modern construction. These areas are variable in size; for desert wildlife conservation, they are usually relatively large, i.e. up to 100 k², and remote. To serve their purpose; for conservation of marine and coastal wildlife, they could be quite small (such as small islands). Where appropriate and possible, “Wildlife Corridors” that link critical habitats should be zoned in this category.

Protection Level: High with zero impact if possible.

Objectives: To ensure the representation and continued existence of all native flora and fauna elements within the PA in a natural state, to allow for movement of wildlife between critical habitats, and to serve as monitoring sites.

General Management Strategy: No active management other than patrolling, stopping damaging activities, and removing feral species; only non-manipulative scientific research would be allowed. Any existing tracks would be closed to public access and used only for management purposes.

Development: None permitted and all scientific facilities to be removable. In certain coastal areas (Wadi el-Gemal Marsh, Sharm el-Luli, near Marsa Um el-Abas, Qulan Bay, and near Hamata mangroves) some interpretive signage will be allowed.

Public Use: Entry restricted through permitting. Normally only scientific research permitted, but in coastal areas interpretive and educational visits would be allowed to designated sites (see above) under control. Carrying capacity and visitor management would be developed according to site management plans.

PREMIUM WILDERNESS ZONE

General Description: Very high value natural areas set aside primarily for the use of a limited number of visitors to have a rewarding experience in a remote wilderness area.

These areas are extensive in size, often made up of several landscape units, free of manmade constructions, and to be used only in a way that does not necessitate access roads. Transit corridors for tourists would be zoned under this category.

Protection Level: High protection: Minimal impact.

Objectives: The preservation of wilderness environments in a condition as close as possible to their natural states to serve low density, high value/premium wilderness ecotourism, and bring associated benefits to local communities.

General Management Strategy: To limit the number of visitors (in terms of absolute numbers, group size, and number of groups per area), to ensure the preservation of a premium wilderness environment for high value backcountry recreation with limited ecological management. Premium backcountry fees would be charged for entrance to premium wilderness zones.

Development: Only visitor services would be permitted (interpretation panels and signs, toilets, trails, and tracks). Expansion of existing native settlements should be discouraged if possible.

Public Use: Visitors with paid permits. Entry regulated to limit absolute numbers, group size, and number of groups. Visitor carrying capacity to be determined on a site-by-site basis by PAMU. Local communities to carry on traditional practices as long as these do not exceed sustainable use of resources; non-traditional uses—tourism groups—will be limited by aesthetic and physical carrying capacity as determined by the site’s absorptive capacity, but in all cases will be limited (subject to specific site management plans).

NO-TAKE ZONE

General Description: A no-take zone is an area where harvesting of marine resources is prohibited, but passive non-extractive types of ecotourism activities that are considered environmentally benign and scientific research may be permitted.

Protection Level: High protection. Low impact.

Objectives: The no-take zones aim at protecting sensitive habitats from destructive fishing methods, providing refuge for intensively harvested species (target and by-catch species), enhancing production of target species outside the no-take zone, serving as a demonstration area to the extent of human impacts in coastal environments, and providing high quality localities for ecotourism.

General Management Strategy: Regular patrolling to ensure the halting of all fishing activities. Only a limited number of visitors should be allowed, to ensure the preservation of a premium high value resource with limited management input. Premium fees should be charged for reservations in and use of no-take zones. Only non-manipulative scientific research is allowed.

Development: None permitted.

Public Use: Visitors with paid permit. Public use limited to high quality diving and snorkeling tourists (eco-tourists), who would have appreciation for the special conservation privilege these areas enjoy and the pristine condition they should be in.

RECREATIONAL ZONES

General Description: Largely natural areas where public access is allowed but organized to provide visitors with a natural and rewarding experience in the PA. Largely natural areas with high scenic and cultural value and of moderate importance for biodiversity conservation.

Protection Level: Medium level, minimal impact.

Objectives: To provide opportunities for easily accessible backcountry tourism that provides visitors with a rewarding natural experience and generates income for local people.

General Management Strategy: Active management to maintain natural areas and minimize impacts by installation of facilities, monitoring guides, and enforcing Trekker's Code. The carrying capacity in these zones will be significantly higher than in Premium Wilderness Zones, but specific limits will be set to maintain visitor expectations.

Development: Visitor services will be permitted (interpretation panels and signs, toilets, trails, tracks, campsites, and a very limited number of eco-lodges). Only two eco-lodges will be allowed. Sites proposed in coordination with TDA are inland from Qulan village and inland from Sharm el-Luli. (These sites still need formal initial approval from the EEAA, followed with application of normal EIA procedures). The following development criteria (adopted from the TDA LUMP) will apply:

- ◆ Net coverage will not exceed 2 percent of the designated site, or one room per feddan, or whichever is the lower coverage.
- ◆ Height is maximum of two floors, not exceeding 7 meters from base to highest point.
- ◆ All lots in this zone within the protected area should be leased on a concessionary basis and not be sold.
- ◆ Development is only allowed west of the coastal highway, with a minimum of a 200-meter setback from highest high-level watermark.

In addition, a maximum of five campsites designated by PAMU will be allowed within the recreational zone in interior parts of WGNP. Natural growth of existing native settlements is allowed, with vernacular architecture styles, as long as it is not excessive.

Public Use: Visitors to interior areas with paid permit. Organized access within prescribed carrying capacity (subject to specific site management plans). Generally open access for local users.

ARCHAEOLOGICAL PRESERVATION ZONE

General Description: Areas that contain individual or aggregations of important archaeological, religious, or cultural sites. Normally, relatively small areas that contain important archaeological, religious, or cultural sites that require different levels of protection and management.

Protection Level: High protection. Minimal impact. Some of the smaller sites will be physically protected by barriers to prevent vehicular access. Identification signs will be placed at each archaeological site giving restrictions on access.

Objectives: To protect archaeological sites within the PA, some of which may be accessible to visitors in partnership with relevant stakeholders and government authorities.

General Management Strategy: Management strategies will depend on the particular site and partner agency, but for accessible sites the general approach will be to ensure adequate safeguards and interpretative facilities to minimize visitor impact. Significant archaeological sites will be protected and managed in association with the Supreme Council of Antiquities.

Development: None except for the installation of appropriate protective measures and interpretative facilities, all of which should be removable.

Public Use: Only visitors with paid permit. Access to various sites variable according to sensitivity, with some sites permanently or seasonally closed to the public while others may be accessible on a controlled basis. See Appendix 16 for proposed accessibility to archaeological sites (proposed by archaeological expert).

TRADITIONAL USE ZONE

General Description: Relatively large and well-preserved areas where only traditional Bedouin activities (herding, artisanal fishing) for using biodiversity are permitted but controlled. Primarily devoted to the development of indigenous systems and practices for the conservation and sustainable use of biodiversity and internal buffer zones for areas of high conservation interest.

Protection Level: Medium level. Moderate impact

Objectives: To sustain and enhance traditional Bedouin lifestyles and practices.

General Management Strategy: Active management with controls on development, and where resource conservation measures such as grazing reserves, recharging groundwater supplies, veterinary surveillance, and feral animal eradication can be practiced.

Development: Restricted. New tracks are permitted only to communicate with established settlements or areas related to traditional use. Upgrading and development of traditional agricultural activities, including wells, permitted with controls. Expansion of existing settlements allowed with vernacular architecture styles. Visitor services permitted (interpretation panels and signs, toilets, trails, tracks, and camp sites). Fixed facilities for tourism to be limited to Bedouin-managed camps.

Public Use: Visitors with paid permit in inland areas. Access to outside visitors should be reserved for Bedouin-mediated experiences that benefit local communities. Generally open access for local users.

MULTIPLE USE ZONE

General Description: In the marine environment, it includes most of the open waters and offshore sublittoral areas. In the terrestrial environment, it includes small areas of low conservation value that collectively constitute a minor proportion of the PA. These are areas that are already developed (urban areas), or immediately adjacent to urban areas

(Sheikh Shazli Village), or utilized (mining), and have been degraded prior to the declaration of WGNP.

Protection Level: Moderate protection. Relatively high impact

Objectives: In the marine environment, this zone accommodates the relatively intensive marine-based tourism activities occurring in the region, as well as sports and commercial fishing. In the terrestrial environment, the zone accommodates sacrificial areas used for multiple purposes to concentrate urban development and commercial activities such as mining in small areas of relatively low conservation value.

General Management Strategy: Activities closely monitored to ensure compliance with regulations.

Development: Only existing uses will be permitted in accordance with environmental regulations (Law 4/1994). Any new activities should follow EIA procedures. Highly disruptive activities such as granite quarrying should not be allowed and current quarries will be phased out in the near future.

Public Use: Visitors with paid permit in inland and marine areas. Generally open access for local users.

ECOTOURISM DEVELOPMENT ZONE

General Description: Areas designated by Prime Ministerial Decree 134/2003 as “Ecotourism Development Areas.” These are coastal lands located at Ras Hankorab and north and south of Abu Ghusoon town.

Protection Level: Low protection. Moderate impact.

Objectives: Areas designated to establish high quality eco-lodges according to global ecotourism standards to provide unique high value services to Park visitors.

General Management Strategy: Activities closely monitored to ensure compliance with agreed development regulations. A strategic environmental impact assessment will be required for the two Ecotourism Development Zones to assess the overall carrying capacity of the region for development, within the Park context.

Development: Subject to strict development controls in accordance with ecotourism standards adopted in the TDA LUMP regulations, after completion of EIA process.

The following development conditions will apply (adopted from the TDA LUMP):

- ◆ Net coverage for ecotourism facilities is maximum 4 percent of designated lot, with a maximum of two rooms per feddan, whichever is smaller. Footprint for the entire development, inclusive of all recreational facilities, walkways, and infrastructure, to be a maximum of 10 percent.
- ◆ Maximum height of 7 m, with a restriction to a maximum of two floors.
- ◆ Minimum lot size of 250,000 m².

- ◆ Minimum setback of 200 m from highest high-level water mark, but may be more depending on individual site sensitivity.
- ◆ All significant vegetation must be preserved. This includes all littoral vegetation within the 200 m setback area, rare and threatened species, as well as characteristic vegetation of the site that is not part of the construction area.
- ◆ Topographical features greater than 5 m in height may not be altered.
- ◆ Land movement must be minimized and should not produce erosion or dust.
- ◆ All natural drainage must be maintained.
- ◆ Building and road access may not alter existing contours by more than 1 m.
- ◆ Total cut and fill must be equal.
- ◆ Only native species of flora will be allowed for landscaping.
- ◆ Master plan must provide for beach access corridors not less than 25 m wide at 1000 m intervals for public beach access.
- ◆ No lodging facilities are permitted on coastal strip areas fringed by shallow reef flats inadequate for swimming or with access only to deep water subject to high energy wave action.
- ◆ No individual building block may have a dimension greater than 20 m.
- ◆ The setback zone will be maintained as a natural buffer zone, with no construction or disturbance of natural features, habitats, or vegetation. Only beach activities and traditional fishing will be allowed.
- ◆ Except the main access road, all roads will be maintained as unpaved tracks. All traffic should be restricted to designated tracks and roads.

EIAs for developments within this zone will not be granted if they do not comply with the above conditions.

Public Use: Generally open access for visitors and traditional users.

ADJACENT AREA (BUFFER ZONE)

General Description: Strip of variable width surrounding the designated boundaries of WGNP, as defined under Article 3 of Law 102 (Part II).

Protection Level: Low to medium protection: Low, medium, to high impact.

Objectives: To help minimize external threats to the PA from incompatible or unsustainable land-use practices occurring outside the legal boundary. Within the adjacent area, there will be some form of management control over land use. In this regard the “adjacent area” will constitute a nominal “buffer zone.”

General Management Strategy: It is forbidden to undertake activities or experiments in the adjacent area that will have an effect on the protectorate’s environment and nature, except with the permission of the concerned administrative body. Within the adjacent

area there will be some form of management control over land use and commercial activities.

Development: Only tourism related according to LUMP regulations (in TDA lands) and PA regulations elsewhere, depending on location.

Public Use: Open access according to type of activity.

Table 11 shows the kinds of land-based activities allowed in each of the PA's zones, while Table 12 lists allowed activities in marine components.

Table 11 Land-based Activities Permitted in WGNP Zones

Activity	Zone							
	Strict Natural Zone	Premium Wilderness Zone	Recreational Zone	Archaeological Protection Zone	Traditional Use Zone	Multiple Use Zone	Ecotourism Development Zone	Buffer Zone
Recreational Uses								
Ecotourism for activities such as watching wildlife	Permit	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eco-lodge	No	No	Yes	No	No	No	Yes	Yes
Campsites	No	Yes	Yes	No	Yes	Yes	No	Yes
Quad runners	No	No	No	No	No	No	No	No
Trekking	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cultural heritage	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commercial Uses								
Mining	No	No	No	No	No	License	No	License
Quarrying	No	No	No	No	No	No	No	No
Prospecting for minerals	No	No	No	No	No	No	No	License
Charcoal making	No	No	No	No	License	License	No	License
Transport	No	No	No	No	Yes	Yes	Yes	Yes
Traditional uses								
Collection of medicinal plants	No	No	No	No	Yes	Yes	Yes	Yes
Grazing	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Collection of firewood	No	No	No	No	Yes	Yes	Yes	Yes
Visitation to religious sites	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Uses								
Scientific research	Permit	Permit	Permit	Permit	Permit	Permit	Permit	Permit

Table 12 Marine-based Activities Permitted in WGNP Zones

Activity	Zone				
	Strict Natural Zone	No-take Zone	Traditional Use Zone	Recreational Zone	Multiple Use Zone
Subsistence fishing	No	No	Yes	Yes	Yes
Recreational Fishing					
Hand lining / drop lines from shore	No	No	No	No	Yes
Hand lining / drop lines from boat	No	No	No	No	Yes
Net fishing from shore	No	No	No	No	Yes
Net fishing from boat	No	No	No	No	Yes
Trap fishing	No	No	No	No	No
Collecting invertebrates	No	No	No	No	No
Spearfishing	No	No	No	No	No
Commercial Fishing					
Hand lining / drop lines	No	No	No	No	License
Net fishing from shore	No	No	No	No	License
Net fishing from boat	No	No	No	No	License
Trap fishing	No	No	No	No	No
Trawling	No	No	No	No	No
Aquarium fish collecting	No	No	No	No	License
Spearfishing	No	No	No	No	No
Other Commercial					
Aquaculture	No	No	No	No	Permit
Mineral exploration / development	No	No	No	No	No
Charter vessels – fishing	No	No	Permit	Permit	Permit
Charter vessels – other	No	License	License	License	License
Eco-tourism activities	No	License	License	License	License
Other Recreational					
Boating	No	Yes	Yes	Yes	Yes
Surface water sports	No	No	Yes	Yes	Yes
SCUBA diving	No	Yes	Yes	Yes	Yes
Snorkeling	No	Yes	Yes	Yes	Yes
Reef walking	No	Yes	Yes	Yes	Yes
Beach activities	No	NA	Yes	Yes	Yes
Other Activities					

Activity	Zone				
	Strict Natural Zone	No-take Zone	Traditional Use Zone	Recreational Zone	Multiple Use Zone
Groyne, jetties, moorings, etc.	No	Permit	Permit	Permit	Permit
Scientific research	Permit	Permit	Permit	Permit	Permit

Strategic Environmental Assessment

The zoning scheme provides a categorical screening for activities that are permissible or prohibited from the various zones, but does not yet provide a measure of allowable intensity of use. It is the intention of this plan to further elaborate the anticipated carrying capacity of zones within and adjacent to the Park. This will be carried out through a Strategic Environmental Assessment (SEA).⁹

The purpose of the SEA is to examine, from a comprehensive regional perspective, the cumulative, short- and long-term impacts on WGNP and its buffer zone from existing, planned, and anticipated activities. It will also prepare appropriate mitigation plans that would include permitting systems (see below), carrying capacity caps, and development restrictions that would extend to specific investments in or adjacent to the Park.

The SEA analysis would include:

- ◆ Local resource utilization and management activities by local residents (subsistence/traditional economy).
- ◆ Pre-existing and approved commercial activities (commercial fishing, mining, trade and services, including facilities like the “Click” telecommunication repeater stations).
- ◆ Planned or predicted commercial activities that would support ecotourism and other tourist development, planned or predicted infrastructure requirements to support ecotourism, and other tourist development.
- ◆ Visits of day-trippers to the Park from nearby resorts outside the Park, from live-aboard dive boats and other sources and their use of marine and terrestrial resources.
- ◆ Uses of marine and terrestrial resources by guests of the eco-lodges within the Park.
- ◆ Possible range and severity of impacts on marine and terrestrial resources from the current land allocations of the Low Intensity Development zones (LIDs)—the pre-existing allocations in Ras Hankorab and Abu Ghusoon.

This SEA should take place within the framework of the current RSSTI project.

⁹ The SEA is a systematic process for identifying, predicting, reporting, and mitigating environmental impacts of proposed policies, plans, or programs. SEA is intended to ensure that individual policies and investments are complementary to one another in achieving the aim of sustainable development, and fulfill the requirements of international, national, regional and local sustainable development goals (United Kingdom SEA directive).

Licensing and Permits

A comprehensive, consistent, and stable licensing and permit system needs to be developed, identifying activities that need to be licensed, prerequisites for licensing, and arrangements with other stakeholders about who should participate in the licensing process. The licensing and permitting system will depend on an analysis of carrying capacity for marine and terrestrial resources based on the predicted impacts of permitted activities (see SEA above). Modeling can be used to establish permitting limits. Methodologies for this type of analysis are well-established and used elsewhere.

Licenses are used to regulate certain long-term and stable activities, where regulations do not need to be adjusted, such as quarries and eco-lodges. Permits are given for shorter periods where seasonal adjustments might need to be made on a short-term basis, such as for fishing, research, or entering closed zones.

Permits and licenses are also to be used as a method to inform users of the PA regulations and to educate them about the park's value. All licensees should receive a standard information–education package along with their permits or licenses.

The possibility of collecting fees for concession licenses should be investigated within the framework of revenue generation in Red Sea PAs at large. EEPP's Conservation TA Team is currently (2004) finalizing a revenue generation plan for Red Sea PAs for NCS/EEAA.

Visitor Management

Visitor management will be one of the most important roles for the PAMU. A detailed visitor management plan will be developed to ensure that activities of visitors and other users of the Park are regulated, and kept within permissible levels and appropriate zones, without being too impractical or too restraining to visitor enjoyment of the Park. The plan will depend primarily on a combination of a paid permit system, limiting the number of visitors, controlled access points, public information, and patrolling. Carrying capacity for various marine and terrestrial parts of the Park will be developed through the planned SEA for WGNP.

Because the Park is traversed by two main coastal highways (along the coast and inland to Sheikh Shazli), only visitors leaving these highways will be considered to be visitors requiring permission and need to pay a user fee. Coastal areas (east of the coastal highway) will be open to free public use in designated areas. Visitors to the marine component of the Park will be subject to the unified fee currently being introduced throughout the Red Sea. Premium destinations such as Satayh Reef will be subject to premium fees and visitor number limitations, such as those adopted at Samadai Reef.

Controlling visitors to inland parts of the Park will be more challenging, as potential entry points are numerous. However, certain entry points and routes will be designated and indicated on the ground and on Park maps. Tour operators should be informed of

these regulations and violators should be made accountable. Permits given to visitors will indicate routes used, locations visited, and camping areas to be used to enable the PAMU to calculate visitor density at each site, and ensure visitor safety. Fees will be calculated according to number of days and number of visitors. Premium fees could be levied at high-value sites that are subject to heavy use such as the Sikait and Nugrus archaeological sites.

Regular patrolling, enforcement, and public information will be essential components in implementing the permit system. The PAMU staff will be responsible for conducting random ticket checks, as part of their regular patrolling duties, to ensure that visitors have valid permits.

Local inhabitants and other users of the interior parts of the Park (e.g. mining company) will need to be identified and in some cases (in some sensitive areas) given special permits.

Although the visitor permitting system can be introduced almost immediately, fees should not be collected until at least some minimal Park infrastructure and basic services have been introduced and obvious degrading or haphazard activities halted.

Patrolling

Patrolling is the main and most basic management tool to be used by the PAMU. All PAMU staff, regardless of specialization (with the exception of technicians), will be obliged to participate in patrolling activities. It is expected that all PAMU staff (with exception of the National Park Manager) will spend between 25–50 percent of their working time on field patrols, spending the balance of their time on their particular area of specialty.

Within NCS/EEAA, patrolling is often considered to be synonymous with “monitoring.” It is important to distinguish between the two activities (see further details under monitoring, below). Patrolling consists of regular or irregular inspection of the PA and its resources, either on land or in the sea. The main objectives of patrolling are to enforce PA regulations, discover and stop violations to PA regulations by PA users, and detect any notable, broad changes in the PA’s natural conditions that might require further detailed investigation and monitoring.

Patrolling intensity and frequency should be higher in PA zones where increased human activities are allowed (as in the Multiple Use Zone, Traditional Use Zone, and Buffer Zones).

Patrolling will be conducted by teams of PAMU staff (rangers and community guards). Patrolling teams must be in full uniform, to affirm their authority and identity. Patrolling teams will have multidisciplinary tasks. While the main objective is regulation enforcement, rangers on patrol could also collect data for use in monitoring programs,

communicate with local inhabitants and community guards, and maintain PA facilities such as signs, buoys, and tracks.

Specific patrolling schedules and routes need to be developed when PAMU staff is more familiar with visitor use patterns and issues. The patrolling schedule will identify specific routes, localities, times, and teams to carry out the patrolling missions.

Safety considerations must be paramount for patrolling teams to avoid endangering PAMU staff. Long desert patrols should be composed of two vehicles, equipped with basic tools, spare tires, extra water, and first aid kits. Similarly, boat patrols must be equipped with life vests and first aid kits. All patrolling units should be linked amongst themselves and with the main PAMU headquarters via direct wireless communication.

Law Enforcement

Enforcement of the provisions of Law 102/1983 and Law 4/1994 is an important obligation for the PAMU. PAMU have police power enabling them to take action against violators of the law. Close contact and coordination with local Coast Guard and police is important to have effective law enforcement.

Law enforcement is one of the primary tasks of all rangers (regardless of specialization). All rangers should get basic training in enforcement procedures and expected professional behavior for dealing with violators. Law enforcement is an important component of the patrolling activity, and patrolling teams should be prepared at all times to carry out their obligation in enforcing the law.

The legal officer (ranger) will be responsible for follow up of prosecution procedures and will keep track of record of details and relevant paper work.

Environmental Impact Assessment (EIA)

EIAs are one of the primary management tools for the PAMU. EIAs should be undertaken prior to the construction of any tourism facility inside the park. The EIAs should follow the “Environmental Impact Assessment Guidelines” (EEAA 1996), the “Environmental Guidelines for the Development of Coastal Areas” (EEAA 1996), and any relevant TDA guidelines. The final EIA should be reviewed, verified by, and approved by the PAMU to ensure that information presented is accurate and the project complies with the PA’s regulations and management objectives.

Site Management Plans

Site management plans are designed to provide specific and detailed management guidance to PAMU staff for small, discrete sites of particular concern due to significant conservation importance and sensitivity. Such sites could be subject to exceptionally high human pressures. An example would be a mangrove stand or sea turtle nesting beach.

Site management plans must conform to the PA zoning plan and its management objectives. Pilot site management plans have been prepared for Ras Baghdadi and Wadi el-Gemal Island, and further plans are under preparation for Qulan Bay and the Sikait area.

Table 13 lists locations that will require site plans. A site management plan has been prepared for Samadai Reef (Dolphin House). The plan was developed by the EEAA, in consultation with local stakeholders and RSG.

Table 13 WGNP Locations Requiring Site Management Plans

Location	Values	Threats
Marsa Um el-Abas	Turtle nesting beach	Egg harvesting, tourist visitation
Ras Baghdadi	Unique vegetation community	Livestock grazing, trampling
Wadi el-Gemal Island	Turtle and seabird nesting area	Egg collecting, tourist visitation
Qulan Archipelago	Turtle and seabird nesting area	Egg collecting, tourist visitation
Qulan Bay	Mangroves, scenic views, local community	Unregulated visitation, solid waste, over development
Sharm el- Luli	Uncommon marine assemblages, seagrass meadow	Tourist visitation, boat activity, pollution
Sikait Ruins	Major archaeological site	Vandalism, collection of artifacts, disturbance
Nugrus Ruins	Major archaeological site	Vandalism, collection of artifacts, disturbance

Species Management Plans

Endangered species and species of particular concern due to their charismatic appeal to visitors, such as Dugong, marine turtles, and dolphins, need special attention to address their particular management needs. The globally threatened species listed in Table 9 are the first candidates for species management plans. Key priority species will include Dugong, marine turtles, and gazelles. The Program Support Unit (PSU) of the EEPP is currently preparing pilot species action plans.

Moorings

Establishing moorings has been the primary tool for the NCS/EEAA to control damage caused by small vessels active in the Red Sea anchoring directly to fragile coral reefs. This is one of the main threats the marine tourism activities cause to the marine resources of the region.

Moorings are prescribed in the WGNP for three main reasons:

1. They protect corals and other organisms by eliminating the need to anchor directly on the reefs.
2. They provide extra security and convenience for vessels visiting the PA.
3. To indicate where visitation is permissible in the marine part of the PA (i.e. moorings are to be placed only where diving activities are allowed; no anchoring will be allowed where buoys are not present).

Riegel & Luke (1997b) listed 9 locations where vessels anchored or moored in the PA (Table 14). Now most of the locations listed by Riegel & Luke (1997b) have moorings. In addition, there may be other areas in the PA where vessels continue to anchor or cable moor because of the absence of buoy moorings. The rates of vessel visitation given

Riegel & Luke (1997b) have almost certainly increased since 2001, because safari boats have been operating out of Marsa Alam and Hamata, and many new resorts have their own day boats.

Table 14 Locations in WGNP Where Vessels are Known to Anchor/Moor

Location	Geographic Location
Ghadeira Um Halhalla	24 51.77 N 35 03.77 E
Ghadeira Douani	24 50.30 N 35 01.94 E
Erg Ghadeira 1	24 50.03 N 35 04.33 E
Shaab Sharm	24 47.34 N (E not given)
Shaabrur Wadi el-Gemal	24 39.71 N 35 07.99 E
Erg Dynamite (Wadi el-Gemal)	24 38.37 N 35 10.88 E
Ras Honkorab	24 33.60 N 35 10.19 E
Ranga	24 24.78 N 35 15.45 E
Shaab Mahsur	24 14.48 N 35 39.10 E

In 2002, the PSU staff in Hurghada realized the urgent need to install new moorings or replace damaged moorings on reefs south of Quseir. In December 2002, the EEPP–PSU, in partnership with EEAA, the Hurghada Environmental Protection and Conservation Association (HEPCA), and the RSG, began to install moorings at several locations between Quseir and Ras Banas, an area encompassing the PA waters. At the time of writing, 78 moorings, 76 pin and 2 mantas, have been installed, mainly in the Fury Shoals. The 76 pin moorings were installed on both the reef flat ‘reef-top pins’ or the reef floor ‘reef-floor pins.’ The location of each mooring, the numbers of moorings per reef, maintenance recommendations, and financial options are described in the ‘Red Sea Mooring Buoy Strategy’ (see “CMA Management Plan”).

Monitoring

Monitoring is the primary source of information and data to direct and adjust management, and is an essential part of the management process. Monitoring generally involves the collection of data over time with the objective of detecting change in a particular situation. It is an activity carried out with an objective in mind, usually to detect departures from a set standard. For example, to detect if certain activities in the PA are having negative impacts on particular resources, and to provide timely warning of the deterioration in the conservation status of certain species, allowing remedial action to be taken. Monitoring is not an academic exercise, but a practical one that must produce data to be interpreted and fed back into management mechanisms.

Monitoring should be a carefully designed and focused with specific objectives that aid in important management decisions. The monitoring process can be divided into two components: an initial step that involves assessing the existing status of resources and establishing the best methodology to use. The second step is more or less a replication of

the initial assessment (or parts of it) over time, using the same methodology. The initial phase is crucial because it sets the tone for a long-term effort, which if not well designed, thought out, and practical, would not produce the desired results and be sustainable.

In biodiversity monitoring it is impractical to design several parallel systems to address various taxonomic groups independently. It is more efficient and logical to adopt a general methodology applicable to all faunal groups and flora as much as possible.

In the initial stage, the aim should be establishing methodologies to collect field data and collate baseline information on the resources of the PA. This would help develop an understanding of the natural trends and processes of the local ecosystem. In order to gain such understanding and to be able to distinguish between what is natural and not natural, results of monitoring over a period of time are needed.

Several important issues should be considered carefully at the outset of a monitoring scheme:

- ◆ **What to monitor?** Data collected should show meaningful trends and be useful for future management applications, as well as be practical to collect in a sustainable fashion. In the case of biodiversity monitoring (for example) one should aim at monitoring species range, abundance, and habitat condition.
- ◆ **How to monitor?** Monitoring should be systematic, regular (not necessarily frequent), and sustained. The methodology should be simple, require minimal resources, and could be integrated with more regular ranger activities.
- ◆ **How frequently to monitor?** This should be relevant to the phenomena being studied. Although supplementary data should also be collected on an *ad-hoc* basis during regular patrolling by park rangers.

Grid Cell System

It is proposed to use a 0.10° grid system as the basis for recording all fauna and flora observations during regular patrolling missions in the PA. The grid cell system will greatly facilitate spatial analysis of data acquired and help to indicate gaps in geographical coverage. This will contribute to building a knowledge base about the PA's resources and help identify gaps in knowledge, focusing survey work to target poorly covered locations. Data collected in the field should be integrated with the existing database at the IT/GIS unit in Hurgada. The 0.10° grid system has been proposed and adopted in the St Katherine and Siwa PAs as a basis for data collection and treatment. The uniformity in data treatment among PAs in Egypt will also facilitate the possibilities for comparative and system wide analysis.

Active Searching (Prospecting)

This is a non-quantitative, simple, and practical technique. The main objective is to document the presence and distribution of species within and among grid cells. Casual or opportunistic observations made by PAMU staff during routine tasks would fall within

the scope of this data collection technique. All observations are to be recorded on standard forms.

Monitoring Specific Sites

Monitoring specific sites can be adopted for two purposes: to assess impacts on particularly sensitive sites or habitats, or at localities subjected to particular pressures; and to establish long-term monitoring stations for the PA. The latter requires establishing permanent transects at localities with good representation of the habitats and morphological features of the PA for long-term monitoring.

The PAMU could establish permanent monitoring routes linking series of transects that sample the protectorate's various habitats. These would be visited regularly in order to produce a reasonable time series that can be used in assessing changes in populations, impacts of human activities, and responses to management practices.

Indicators

An effective way to monitor ecological and environmental change is to establish indicators that would be the prime targets for future monitoring activities in the PA. In the section titled "Management Issues, Policies, and Actions," indicators are proposed for each management objective. This need to be further refined and organized in logical clusters that would form the backbone of the PA's monitoring program.

A popular ecological indicator is an "indicator species," which is a species of narrow ecological amplitude with respect to one or more environmental factors and which, when present, is indicative of a particular condition or a set of conditions. Indicator species are often used to sum up the ecological condition of a particular environment. Ideally, indicator species should be prominent, easy to detect, easy to identify, and sensitive to environmental change. Examples of good indicator species in WGNP include Dorcas Gazelles *Gazella dorcas*, Ocellated Dab Lizard *Uromastix ocellata*, and marine turtles.

Reporting

Reporting is an important activity for the PAMU. It serves to inform the central offices of NCS of progress made, problems, and needs, and also lets the PAMU take stock on a regular basis of its achievements and ability to meet PA management objectives.

All PAMU staff will submit a monthly report to the PAMU Manager by the 28th of every month. Community guards' reports will be collected by visiting rangers on a monthly basis. The PAMU manager will be expected to submit the PAMU report (according to NCS specified format) to the Regional Red Sea PAs office in Hurghada and NCS head office in Cairo by the 1st of each month. A monthly financial statement is to be returned to the Red Sea PA financial controller in Hurghada by the 10th of the following month.

NCS also requests annual reports for each PA. The format for this report should be obtained from NCS offices in Cairo.

IT and GIS

IT and GIS are important, efficient modern management decision-making support tools. The GIS unit at the PA regional office in Hurghada has accumulated an extensive database of satellite images of the Conservation Management Area (CMA) and WGNP, and the distribution of the major coastal and marine resources and human resources in the region. However, the efficiency and usefulness of GIS depends greatly on the overall design of its role in the management of the resources at hand.

A GIS unit will be established as part of the PAMU, and will function as a local node of the Hurghada GIS unit. The two units will interact directly. The local unit will serve PAMU management needs and benefit from the already existing capacities at Hurghada. In the meantime, it will digest locally-generated data and information to be used at the regional unit and at central NCS databases.

At the PAMU level, the IT/GIS unit will collect data from monitoring programs, patrolling, the spatial distribution of human development, welfare and economic activity in the PA, and the distribution of sites and natural resources of conservation interest. The unit will ensure that data is processed in an orderly fashion and retained for future use and analysis by the PAMU. The IT/GIS unit should be involved from early stages in the design and formulation of monitoring programs to ensure adaptability of collected data.

Monitoring and management of this database will be a critical and demanding tasks. It must be possible to integrate information from a wide, but controlled and defined, range of categories, adopt new data categories when they arise, and be able to demonstrate the comprehensiveness and limits of the database.

A review process needs to be periodically undertaken to ensure that the Red Sea/WGNP GIS information database is developing usefully. The priority is to identify a checklist of data categories of spatial information representing the human and natural processes in the PA that need to be complete and up-to-date.

Restoration and Rehabilitation

Rehabilitation and restoration of landscapes and habitats is a management tool that is used to regain the natural features and ecological functions that were lost due to human impacts. Restoration and rehabilitation should only be applied after the causes of degradation have been halted or are under control.

Examples of areas that need restoration in WGNP include the now non-functional granite quarries in Wadi Shawab and in the Gebel Hamata vicinity. Removal of the large accumulations of solid waste from marsas, sharms (bays), and mangrove stands of WGNP would also qualify as restoration measures. Some of the degraded mangrove stands in the Hamata area would also be good candidates for rehabilitation activity.

The PAMU will take the lead in landscape restoration along important tourism routes within WGNP (removing accumulations of waste and graffiti), and will regularly organize beach cleanups at designated recreational localities.

Public Education and Information

Public education is one of the most important management tools in the PA, seeking to increase public awareness and stakeholder support. Public information is important to notify users of the PA regulations and restrictions. The target audiences are indigenous communities; tour operators; tourists; local, regional, and national authorities; hotels; investors; and schoolchildren.

Particulars of public education and information activities should be worked out in a detailed Public Awareness Strategy to be established by the PAMU.

Short-term activities should include direct communication between PAMU and the primary stakeholders in WGNP, publishing a brochure and establishing signage in the PA.

Signs and Signposting

Signposting of a PA is one of the principal elements needed to guide visitors and residents through the area, making them aware of the PA's existence and particular places and facilities. Signs would need to be posted throughout WGNP as a means to inform and educate visitors. Three types of signs will be used: to inform visitors and other users of WGNP of the boundaries of the PA, signs with instructions and prohibitions, and signs that inform visitors about facts of educational value or points of interest.

A comprehensive signposting plan is needed to ensure the entire system would be integrated and stylistically harmonious. All PA signposting within WGNP will be consistent in style, should show NCS/MSEA/WGNP logos, and whenever possible, use natural materials.

The Academy for Educational Development (AED), an EEPP contractor supporting awareness and communication activities, is preparing a number of educational signs for points of visitor interest and instructions to the PA users. AED will also prepare signs to delineate the legal boundaries of the PA to be placed at the coordinates mentioned in the PA declaration (20 land-based coordinates). Four suitable signs (relatively small, low key, and preferably made of local natural materials) will be placed at the southern and northern entrances of WGNP, along the coastal highway, one at the juncture of the Edfu–Marsa Alam highway and Sheikh Shazli road, and another at the northern entrance on the Sheikh Shazli road.

Signs not belonging to WGNP will be kept to a minimum with no roadside commercial billboards allowed within WGNP. Within urban areas only, one simple sign per

establishment (hotel or restaurant, for example) will be allowed. This may be simply lit at night with no flashing or colored neon lights.

Visitor Facilities and Infrastructure

The park will need to develop a wide variety of infrastructure and facilities to cater to visitors. There would have to be detailed studies of visitor infrastructure and facilities prior to construction. The design, construction, and maintenance of such facilities should take into consideration



Visitor outlook at WGNP entrance

environmental impacts and utilize ecologically sound

designs, traditional materials, and appropriate technologies. It is suggested that these facilities be constructed from local materials such as stone, in particular the scrap granite in the mines around the park. It is also recommended that adaptive reuse be employed whenever appropriate. There are a number of abandoned buildings inside the park that belong to the local communities and mines that could be converted for use as visitor facilities.

Visitor Centers

The need for one or more visitor centers and their nature and location should be assessed. Such centers could be elaborate, with exhibits, educational facilities, cafeterias, and gift shops, or quite simple.

Outdoor Displays

Outdoor displays can be set up at various sites for educational purposes. Such displays are recommended for sites of high visitor value, such as Wadi el-Gemal Marsh, Hamata Mangroves, Marsa Um el-Abas, and the Wadi el-Gemal entrance.

Tracks

Tracks would have to be marked and some upgraded. Some tracks would have to be closed for conservation reasons, such as the track through the downstream part of Wadi el-Gemal (from the coast road up to the mountains).



A view of the main entrance to WGNP at Shams Alam as it is constructed in May 2004

Hiking Trails

Suitable areas for hiking trails need to be identified. Trails are needed in the Wadi el-Gemal Delta, as well as at Nugrus, Sikait, and Zabara.

Boardwalks

Boardwalks are recommended at the Wadi el-Gemal Delta and Hamata Mangroves to reduce destruction and disturbance to the natural vegetation.

Observation Towers and Hides

Observation tower(s) and hides could be constructed at appropriate locations to facilitate viewing and minimize disturbance to the wildlife. It is recommended that an observation tower be constructed at the Hamata Mangroves and hides erected near wildlife feeding and drinking sites.

Viewpoints

Along the asphalt roads and some desert tracks it is recommended that lay-bys be established where vehicles could park to observe nature and photograph the scenery. Viewpoints are needed on the coast road, Sheikh Shazli road, and the track running along the edge of the coastal plain section of Wadi el-Gemal.

Picnic Areas

Picnic areas could be developed at appropriate locations along the coastal and Sheikh Shazli asphalt roads.

Shelters

Permanent shelters providing shade from the sun could be built in suitable areas where there is high tourism use. Recommended sites for shelters are at swimming areas, picnic areas, campsites, and next to visitor centers.

Campsites

Suitable campsites would be identified throughout the park, including one on the coast at Ras Honkorab and another on the Sheikh Shazli road. Toilets, barbeques, and other visitor amenities would be established at such high use sites. Campgrounds in the desert should be simple sites, with signs posted showing where camping is permitted.



Ranger outpost near Abu Ghusoon

Waste Receptacles

At certain high use areas—locations such as picnic sites inside the PA—appropriate (non-offensive) waste receptacles should be set-up and regularly cleaned out.

Piers

Piers might be needed at islands where wildlife tourism is developed to establish a means to facilitate disembarkation of visitors from the boats. Such islands might include Siyul and Wadi el-Gemal Islands.

Toilets

Suitable biodegradable (waterless) toilets (such as those in use in St Katherine PA) will be needed at various locations where there is high visitor use, such as at the proposed recreational beach at Sharm el-Luli.

7. Management Resources

In order to facilitate the effective management of the PA, essential resources have to be available. The single most important management resource is a motivated and committed staff with a good understanding of conservation management principles. PA staff with clear, well-defined responsibilities and good lines of communication are important to establish a coherent and self-sufficient management unit. Communications within the PAMU and with other Red Sea Rangers, as well as, with NCS are important.

Basic infrastructure and equipment are needed to make the management duties of the PAMU possible. Sufficient financial support will have to be made available to develop the PAMU resources over the next 5 years. Ideally, self-sufficient systems should be developed, whereby financial support to the PAMU is linked to revenue generation mechanisms within the PA or the national PA system.

The Protected Area Management Unit (PAMU)

The PAMU is the unit responsible for management and administration of WGNP. It is directed by the PA manager and should normally report to the Red Sea PA Regional Manager in Hurghada, but direct reporting to NCS–Cairo is expected on matters of an urgent nature.

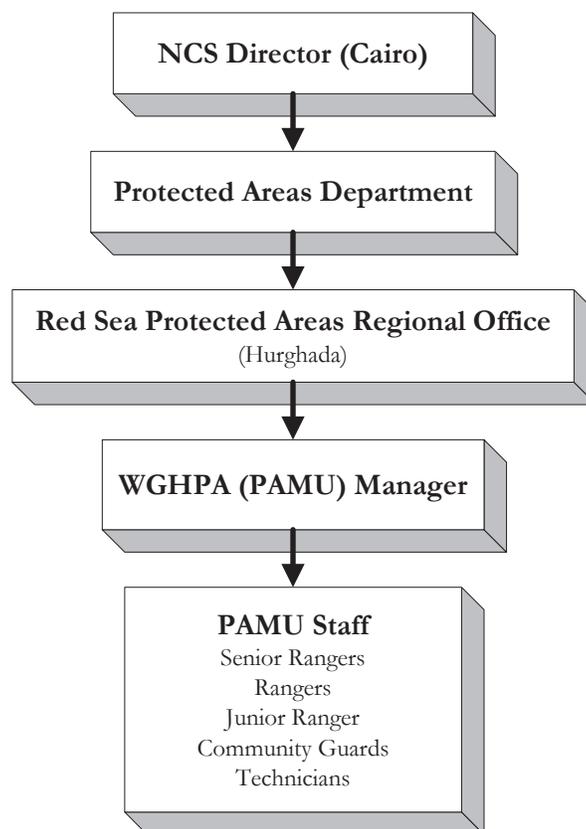
PAMU Staff

The PAMU staff is going to carry the responsibility for maintaining the resources of the PA and ensuring that its objectives are met. Careful selection of future staff, clear job descriptions, training, and well-defined career development lines are all important elements in developing a successful and effective team.

The PAMU administration will recruit sufficient suitable staff for the management of WGNP. The global mean of PA staff per 1,000 km² is 27, while the average for Africa is 70 staff per 1000 km². In Egypt, the situation is variable: at Zaranik PA, it is at 80 staff per 1,000 km², while in St. Katherine PA, the staffing levels are at 16 staff per 1,000 km². The target of 20 staff per 1,000 km² was recommended for St. Katherine PA in its management plan.

In WGNP, where many management issues are comparable to those in St. Katherine PA (except for the marine component), a smaller number of about 10 staff per 1,000 km² could be sufficient as an initial target. Half that number would probably be sufficient per 1,000 km² of marine habitats. This gives a target figure of about 50 staff members for WGNP over the next 5 years. See Appendix 17 for a detailed staffing plan and Figure 1 for the proposed organizational structure of the staff.

Figure 1 Organogram for WGNP PAMU within the NCS



STAFF CAREER DEVELOPMENT

It is important to establish a career track for PA staff to promote the spirit of achievement, encourage personnel development, allow the advancement of outstanding staff, and provide NCS management a way of promoting qualified staff members. The seven career ranks for PA staff within the NCS/EEAA, as shown in Tab x, have been adapted from the St. Katherine PA Management Plan. It is proposed to adopt this system throughout the PA network and to further formalize it within the NCS structure.

Table 15 Proposed Career Ranks for WGNP Staff

Rank	Basic Qualification
1. Senior NCS Management Positions	Postgraduate degree, more than 10 years work in PAs
2. Regional Manager	Postgraduate degree, 10 years work in PAs
3. PA Manager	University degree, more than 5 years work in PAs
4. Senior Ranger	University degree, 5 years work in PAs
5. Ranger	University degree, 3 years work in PAs
6. Junior Ranger/Technician	Recent university graduate
7. Community Guard	Basic schooling, nomination from local community leadership

PAMU STAFF DUTIES

The main roles and functions of field staff defined below are based on the legislation concerning PAs (Law 102/1983 and Prime Ministerial Decree 264/1994) and on the Environmental Law (Law 4/1994).

Rangers have general responsibilities for:

1. The management of the PA.
2. The awareness and education of the public.
3. The application of regulations and enforcement of the law.

Duties of **PAMU Manager** (PA Manager):

1. The PAMU manager is both the PAMU office administrator and field staff manager for the PA and should integrate, coordinate, and stimulate the staff under his command to achieve the stated objectives of the PA for which he is responsible. The PAMU manager should be familiar with the PAs' legislative instruments and apply these as appropriate.
2. The PAMU manager will assist with the development of operational management plans for the PA under his control and have the responsibility for implementing such plans.
3. The PAMU manager is responsible for the efficient day-to-day operation and performance of their duties by the Rangers under his control. He is expected to implement NCS/EEAA PA policy and directives effectively and efficiently in liaison with other agencies and to lead the Ranger force by example. The manager's specific responsibilities include:
 - Deploying Rangers and Community Guards and allocating monthly and daily tasks, including patrol schedules, in order to achieve the objectives of the PA under his control.
 - Ensuring that Rangers and Community Guards know what is expected of them and how to do it. This will involve some training, especially of new staff before deployment.
 - Coordination of Ranger and Community Guard activities, both in the PA and in the Red Sea PAs as a whole (with the Hurghada office), to avoid duplication of effort and to ensure efficiency and the best possible use of resources. This will call for careful planning and intimate knowledge of where Rangers are deployed and for what purpose
 - Receiving information and reports from field staff and transmitting relevant information to the appropriate authorities.
 - Ensuring that Rangers are in uniform, and can be characterized as smart and disciplined when on duty, conducting themselves in a manner befitting an EEAA staff member. The Manager will be expected to take minor disciplinary action where appropriate.

- Ensuring that all PAMU property is properly cared for, maintained, and serviced where appropriate.
- Proper disbursement of and accounting for all PAMU finances.
- Ensuring that all PAMU infrastructure sites are kept clean and refuse is disposed of in a proper manner.
- Ensuring that required monthly and annual reports are prepared and sent to the PA Regional Office in Hurghada and to NCS Offices in Cairo.

Duties of a **Senior Ranger**:

As the PAMU manager cannot personally organize the individual activities of all the field staff, some of the Manager's responsibilities will be delegated to a competent and experienced Ranger.

1. The Senior Ranger will carry out any duty directed by the PAMU manager and which may be delegated to another field staff member only with the approval of the PAMU Manager. The Senior Ranger will be well acquainted with the PA conservation objectives and assist with the development of interventions to achieve these objectives. In addition to the general duties of a Ranger (see below) the Senior Ranger will be charged with the following:
 - Responsible to the PAMU manager for the care and cleanliness of all PAMU property. He should advise the manager of any items that need attention, particularly vehicles, for which he is expected to maintain a strict service schedule (according to manufacturers' specifications) and ensure that logbooks are properly maintained.
 - Ensure that an adequate patrol program and schedule is drawn up and followed; the Senior Ranger is responsible for collating all information from patrols and ensuring that the PAMU manager is kept informed of all developments on a daily basis.
 - Act as a fully participating member of the patrol program.

Duties of a **Ranger/Junior Ranger**

The Ranger is the foundation of the PAMU staff establishment without whom little of the EEAA's mandate for PAs would be possible. The Ranger is a member of a team who should be loyal and committed to the ideals of the NCS/EEAA and its mandate. Rangers are qualified professionals in their own right and will need to apply their specific skills to their work. At the same time, they are expected to be versatile and use their initiative as circumstances dictate. The Ranger is the public face of the NCS/EEAA and on duty must be disciplined at all times, helpful and polite to all members of the public. In addition to their specific allocated duties, Rangers will be expected to:

1. Carry out instruction from the PAMU manager to the best of their ability. Duties assigned may include foot and vehicle patrolling (day and night), resource monitoring and data collection, public awareness, search and rescue, visitor management, refuse

collection, equipment and infrastructure maintenance or cleaning, development planning, and inspection. The Ranger will be expected to work as many hours as circumstances dictate.

2. Carry out patrols as directed by their Manager, pass on information to their superiors, and keep a log of all incidents.
3. Uphold the laws for which they are responsible and initiate actions against transgressions of these laws without fear or favor.
4. Wear a full uniform at all times while on duty and communicate and interact with the public in a mature and controlled manner, to set a good example to fellow citizens and portray the EEAA in a positive light. This includes vehicle handling and road safety measures.
5. Be accountable for all PAMU property under their responsibility and to report any item that needs attention. Rangers will be responsible for maintaining vehicle logbooks for the vehicles in their charge.
6. Maintain specific and general reporting schedules.
7. Encourage and assist the local community to undertake local conservation initiatives and community development projects through self-help projects.

Duties of **Community Guards**

The Community Guards will be a non-uniformed cadre to supplement the Ranger force. They will have no formal power and their primary functions will be to extend PAMU monitoring and regulatory activities to the more remote parts of the PA. They will report to PAMU Rangers. The community guards will carry PAMU identification cards and wear a National Park badge. The community guards will assist the Ranger force in the execution of their duties by:

1. Reporting any hunting, killing, disturbance, or collection of wild species (including plants) in or around the PA, and monitoring and reporting on wildlife populations, particularly of large mammal species.
2. Reporting any developments such as building or quarrying in their area and monitoring development activities.
3. Guiding and assisting Rangers, orienting visitors within their area of responsibility, and assisting with mountain rescue and other emergency responses.
4. Reporting on the condition of trails and paths and undertaking or arranging necessary maintenance.
5. Looking after any established monitoring sites and equipment, and manning established outposts or other PA property.
6. Promoting PA regulations regarding resource conservation, e.g. grazing exclusion areas, within the local communities.
7. Monitoring tourism activities within the area (i.e. recording visitor numbers, tour companies, and trip dates) and checking on and regulating visitor behavior to prevent visitors from cutting vegetation, discarding rubbish, and writing graffiti.

8. Cleaning visitor campsites of refuse and removing graffiti.
9. Promoting local community conservation and development initiatives, e.g. establishing local conservation areas, waste management, and social programs.

Distribution of PAMU Staff

WGPN covers a large area, including both terrestrial and marine components. It is impractical to manage the PA efficiently on a daily basis as a single unit and from one base. It is proposed to divide WGPN into three management sectors: A northern, southern, and inland sectors. See Map 16 and staffing plan in Appendix 17.

THE NORTHERN MANAGEMENT SECTOR

This sector starts from the northern boundary, near Shams Alam Resort, and ends at the village of Abu Ghusoon, including offshore marine waters. The inland boundary will be the longitude of Bir Wadi el-Gemal. The administrative focal point of this sector will be near Shams Alam Resort, where mobile cabins will be established for the PAMU staff in the short term. In the long term, more substantial premises will be needed as PA headquarters, where the PA manager and most staff will be based.

THE SOUTHERN MANAGEMENT SECTOR

This sector starts from the village of Abu Ghusoon to the southern boundary of the PA near Hamata, including offshore marine waters. The inland boundary will be the longitude of Bir Wadi el-Gemal. The administrative focal point of this sector will be Hamata. Some abandoned buildings can be rehabilitated to accommodate the PAMU staff in town.

THE INLAND MANAGEMENT SECTOR

For this sector, the eastern boundary will be the longitude of Bir Wadi el-Gemal, westwards to the Sheikh Shazli road (western boundary of WGPN). This sector includes the inland part of the PA. The administrative focal point of this sector will be near at Sheikh Shazli town. Mobil cabins could be based there for the short-term use by PAMU staff. This would be more of a satellite base for PAMU staff to use occasionally while on patrol. It is not envisaged that PAMU staff will be based there permanently in the short term. Community guards would man the PAMU facility.

PAMU Infrastructure

Office Space

In the short term, the PAMU administration will be based in the Shams Alam porta cabin. At a second stage, similar portable space would be established at Hamata to manage the southern sector of the Park. Additional office space is proposed for Abu Ghusoon.

Piers

In order to launch an effective marine patrolling system, PAMU will have to establish several bases where its vessels would be maintained and harbored, and from which they can be launched on a regular basis. It is proposed that initially two existing piers be used for PAMU vessels: Shams Alam Diving Center and Hamata pier (see Map 16).



WGNP main office and HQ at Shams Alam

Outposts

Outpost stations should be established at critical road junctures, near critical resources, or regularly visited sites in the PA interior. At least three outposts will be needed:

- ◆ At the northwestern corner of the PA near the Sheikh Shazli road (to serve as a possible point for fee collection and control)
- ◆ Near the confluence of Wadi Nugrus and Wadi el-Gemal (to support frequent patrols to the regularly visited antiquities)
- ◆ At the confluence of Wadi Shawab and Wadi Abu Ghusoon (to inspect quarrying and mining related traffic).

These outposts should be simple structures, where some basic gear would be left (such as first aid kits, stores of water, and sleeping bags) to facilitate temporary accommodation for patrolling teams. Rangers would not permanently man the outposts, but community guards from the respective areas would be assigned to maintain them.

Accommodation

Staff are currently housed in the Shams Alam porta cabin. Further space will be made at the planned Hamata porta cabin. Additional staff accommodations (including married quarters) are proposed for Abu Ghusoon.

Maintenance Workshop and Storage

A maintenance workshop will be needed for PA equipment, vehicles, and boats, and appropriate storage for spare parts and equipment. Small workshops will be located near the Shams Alam and Hamata offices to facilitate rapid on-site equipment repair.

PAMU Equipment

The PAMU will need some essential equipment to support its activities in both the marine and terrestrial environments. See Appendix 18 for an indicative list of essential equipment for PAMU staff, targeted within the current planning period.

Facility Maintenance

Regular maintenance of equipment and facilities is an important component of the PAMU's duties to ensure the upkeep of the PAMU capital. A maintenance schedule will be established showing timetables for maintenance and defining the responsible staff to performing the tasks.

8. Finance

Without sustainable and stable sources of funding, the long-term management objectives of the PA will be jeopardized. The NCS has long been seeking financial self-sufficiency for the PA network. From a practical point of view, this goal is realistic and well within reach; however, many administrative obstacles remain to be resolved. In fact, many of the PAs (particularly on the Red Sea) bring in substantial income that could be developed further.

Funding Sources

All PAs in Egypt receive core funding from the annual GOE budget. This is a variable source of funding that is largely directed to paying staff salaries and benefits, and establishing infrastructure. Although the GOE has shown great commitment to PA development and financing, direct reinvestment in the conservation effort is essential for long-term sustainability.

The PSU developed a revenue generation strategy for the Red Sea (Colby 2003) that could be the basis for an agreed framework for sustainable revenue generation and reinvestment in the region's PAs and conservation infrastructure. In view of current developments and efforts by the PSU/NCS in this respect, only brief reference will be made here to revenue generation possibilities.

There are three potential and realistic sources of revenue generation in WGNP:

- ◆ User or entry fees
- ◆ Concession fees or leases
- ◆ Sale of PA products.

Presently, all revenues from other PAs are transferred to the Environmental Protection Fund. This needs to be changed, so that at least a percentage of income generated by the PA is re-invested in its management. Some of the funds could also be allocated to the Red Sea Governorate to support environmental activities such as waste management.

Indicative Budget

An indicative budget will be developed after the review of this draft of the management plan and based on feedback from reviewers and stakeholders.

9. Implementation and Evaluation

Management Priorities

The implementation of this plan will require that priorities must first be identified and then addressed accordingly.

Generally, the first priority should be given to conflict resolution for large-scale activities that might be planned by TDA in the two “ecotourism development areas.” These activities might have a geographically, as well as ecologically, significant footprint on the region. It is best to resolve such conflicts at the planning stage, rather than during implementation, or operation.

Second priority is to halt or control the primary adverse activities that are degrading the natural resource base within WGNP, and that will continue to do so unless management interventions are made by PAMU.

Third priority can be given to public awareness and education. The enhancement of natural resources and promotion of the sustainable utility of resources (such as ecotourism) are proactive measures that seek to improve future utility of the natural resources of WGNP.

The integration of and consultation with indigenous inhabitants should be a constant priority for the PAMU from day one.

Evaluation of Plan Implementation

The implementation of this plan will be effective when it can be verifiably shown that it is achieving its main objectives:

- ◆ Maintenance of the natural resources and conditions of the PA: verifiable through results of monitoring programs.
- ◆ Protection of cultural heritage resources: verified through patrolling reports indicating ending adverse practices.
- ◆ Sustainable utility of natural resources in the PA: verified through results of monitoring programs and the endorsement and adoption of the management plan by stakeholders.
- ◆ Establishment of WGNP as a focal point for ecologically sensitive tourism: verifiable through assessments of the performance of tourism operators and their impact on the natural environment.
- ◆ Maintenance of environmental quality within WGNP: verifiable through results of pollution monitoring programs.

- ◆ Optimization of socio-economic benefits for the indigenous population from the region's natural heritage: verifiable through monitoring data indicating improvements to health and income generation to local people.
- ◆ Promotion of public understanding and appreciation of Egypt's natural heritage: verifiable through results of user surveys, including indigenous people's perceptions.



Revisions

This plan is intended to be a dynamic instrument. Continuous updates are expected and necessary to keep it accurate and up-to-date. It is envisaged that the plan should be completely reviewed and reassessed after 5 years, in light of achievements and shortcomings on the ground.

Annual Operational Plan

An Annual Operational Plan (AOP) will be prepared to facilitate everyday operations, compliance with the policy framework of this management plan, and to ensure that short-term activities actually contribute to achieving larger objectives. The AOP will be drawn up in accordance with the policies and objectives set out in the management plan and will be prepared to justify the PA's annual budget request.

It will be the responsibility of the PA Manager to prepare the AOP, submit it to the Red Sea PA Regional Office and to NCS and obtain approval. This AOP will then be the PA's official annual work plan. The format of the operating plan will generally follow the format of this management plan.

The first draft of the AOP must be drawn up before the preparation of the annual budget for the PA, as the budget should be based on the AOP. The budget and justifying

draft AOP will be presented to the Red Sea PA Regional Office and to NCS, and when the approved budget is received, a final AOP will be prepared and distributed.

Procedures for Preparing an AOP

1. Identify priority actions as given in the management plan, plus any outstanding tasks and new needs. Establish priorities by classifying activities according to urgency: indicate tasks that are vital and must be completed, tasks that are necessary but not urgent, and tasks that are desirable if resources are available.
2. Set a timetable for completion of activities.
3. Identify those activities that are dependent on prior completion of other activities and indicate which activities they must follow, as this will help the PA Manager assign realistic priorities.
4. Plan tasks on a chart, with the most important activities fitted in first, to illustrate the correct time sequence for activities and to spread the workload evenly throughout the year.
5. Once activities are arranged on the chart, the manager should prepare work schedules for each task together with the resources needed to complete each activity.
6. Once detailed task schedules and resource requirements are known, it should be possible to calculate annual budget needs.
7. Reschedule the AOP once the annual budget is approved to bring the tasks and priorities in line with funding constraints.

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Appendix 1: Prime Ministerial Decree No. 143/2003

(Translation from the original Arabic text.)

Prime Ministerial Decree No. 143 for 2003

Establishing a Protected Area in the Wadi el-Gemal–Hamata area in the Red Sea Governorate

The Prime Minister, after consulting the constitution, and Law 102 for 1983 concerning Protected Areas, and Law 4 for 1994 concerning Environmental Protection, and Prime Ministerial Decree No. 264 for 1994 concerning the rules, regulations, and procedures for activities taking place in Protected Areas, and based on what the Minister of State for Environmental Affairs has provided:

It is decreed that:

Article 1:

The area of Wadi el-Gemal–Hamata, in the Red Sea Governorate, is to be considered as a Protected Area, according to the provisions of Law 102 for 1983. The area is indicated in the attached map and defined by the following coordinates:

Boundary Point	Latitude			Longitude		
	Degree	Minute	Second	Degree	Minute	Second
A	24	41	17.83	35	5	3.08
B	24	49	51.77	34	38	56.25
C	24	51	35.59	34	28	25.00
D	24	24	38.98	34	30	30.46
E	24	12	51.71	34	36	26.38
F	24	6	7.24	34	55	45.54
G	24	7	47.08	35	6	42.57
H	24	17	54.25	35	22	4.84
I	24	8	34.51	35	28	23.31
J	24	5	5.02	35	28	53.78
K	24	6	21.92	35	33	36.00
L	24	9	17.61	35	45	22.54
M	24	52	48.12	35	6	22.03
N	24	52	53.77	34	59	28.73

It includes two areas for the development of ecotourism according to the following coordinates:

The first area:

Boundary Point	Latitude			Longitude		
	Degree	Minute	Second	Degree	Minute	Second
O	24	36	4.85	35	8	4.29
P	24	35	41.88	35	6	48.17
Q	24	32	41.85	35	7	8.25
R	24	31	51.32	35	8	40.07

The second area:

Boundary Point	Latitude			Longitude		
	Degree	Minute	Second	Degree	Minute	Second
S	24	30	4.57	35	8	57.01
T	24	29	21.33	35	7	58.72
U	24	22	30.07	35	13	43.38
V	24	23	36.02	35	14	45.30

Article 2:

The Egyptian Environmental Affairs Agency will directly assume the responsibilities decreed in Law 102 for 1983 and Law 4 for 1994 with respect to the Protected Area.

Article 3:

It is forbidden to undertake actions, activities, or procedures that would lead to the destruction, damage, or degradation of the natural environment; or harm terrestrial, marine, or plant life; or detract from its aesthetic quality in a Protected Area. It is specifically prohibited to undertake the following:

8. Hunting, transporting, killing, or disturbing living terrestrial and marine organisms; or carrying out activities that lead to their extermination; or limiting the growth of these terrestrial and marine organisms; or affecting their genetic properties; or damaging their habitats.
9. Damaging or transporting plants found in a Protected Area.
10. Damaging or destroying geographic or geologic formations, or archeological monuments and inscriptions in the Protected Area.
11. Introducing alien species of animals, plants, or minute organisms into the Protected Area.
12. Polluting the soil, water, or air of the Protected Area in any manner or polluting the soil, water, or air of any area adjacent to the Protected Area.

13. Spilling or disposing of liquids, chemicals, oils, wastes, or radioactive material of any kind, or any foreign material in the Protected Area or its adjacent areas that could lead to damaging the Protected Area or detract from its aesthetic quality, biological diversity, or the genetic character of the organisms inhabiting the Protected Area.
14. Erecting buildings, constructing roads, operating vehicles, or practicing any agricultural, industrial, commercial, or tourism activities in the Protected Area and the adjacent areas without the permission of the Egyptian Environmental Affairs Agency, according to conditions, rules, and procedures specified by Prime Ministerial Decree No 264 for 1994.

Article 4:

It is possible to declare other areas as Protected Areas or to increase the area of declared Protected Areas if necessary environmental studies are available.

Article 5:

The Governor of the Red Sea will supervise the execution of this decree in coordination with concerned authorities.

Article 6:

This law is to be published in the official Egyptian journal.

(signed by) Dr. Atef Ebeid, Prime Minister

Issued at the Cabinet of Ministers on 17 Ze Al Qeda 1423, corresponding with 20 January 2003.

Appendix 2: Existing Mining and Building Materials in WGNP

Metallic Iron Ore Group

Material	Location	E	N	Concession	Company	Economic Value
Iron Oxide	Um el-Abas	35° 05' 00	24° 33' 00	Active	Individual	Low
Ilmenite	West Abu Ghalaka	35° 03' 30	24° 21' 23	Active	Company	High
	West Abu Ghusoon	35° 04' 07	24° 21' 18	Active	Company	High

Metallic Non-Iron Ore Group

Material	Location	E	N	Concession	Company	Economic Value
Copper	Hamata– El-Atshan	35° 11' 00	24° 15' 00	Stopped	—	Very low
Lead and Zinc	West Ranga	35° 13' 00	24° 22' 00	Stopped	—	Low
Tantalum	Um Rasheed	34° 46' 00	24° 37' 00	Stopped	—	Low
Gold	Gulan el-Atshan	35° 11' 00	24° 15' 00	Stopped	—	Low

Non-Metallic Ore Group

Material	Location	E	N	Concession	Company	Economic Value
Feldspars	Um Khyam	34° 32' 09	24° 46' 17	Stopped	Individual	Low
	West El Gemal	34° 42' 00	24° 31' 00	Stopped	Company	Low
	Hafafet	34° 40' 00	24° 35' 08	Active	Individual	Low
	Abu Had	34° 40' 30	24° 35' 30	Active	Individual	Low
	Abu Had	34° 37' 45	24° 36' 56	Stopped	Individual	Low
	Abu Had	34° 36' 42	24° 37' 30	Continue	Company	Low
			34° 43' 00	24° 31' 00	Stopped	Company
	Kab Marfoa	34° 37' 04	24° 31' 22	Stopped	Company	Low
Quartz	West El Gemal	35° 02' 00	24° 38' 00	Stopped	—	Low

Material	Location	E	N	Concession	Company	Economic Value
	Um Sweih	34° 53' 00	24° 28' 00	Stopped	Company	Low
	West Raadi	35° 14' 00	24° 14' 00	Stopped	Individual	Low
	West Zabara	34° 43' 44	24° 48' 20	Stopped	Individual	Low
	West El Gemal	35° 01' 46	24° 37' 31	Stopped	Individual	Low
Asbestos	Hafafet	34° 30' 00	24° 49' 00	Stopped	—	Low
Talc	West El Atshan	35° 11' 00	24° 15' 00	Stopped	Individual	Low
	Gebal el-Agzia	34° 57' 00	24° 18' 00	Stopped	—	Low
	West Raadi	35° 17' 00	24° 13' 00	Stopped	Company	Low
	West Zabara	34° 43' 44	24° 48' 20	Stopped	Company	Low
	West El Lawy	34° 47' 44	24° 46' 09	Stopped	Company	Low
Vermiculite	Hafafet	34° 30' 00	24° 49' 00	Active	Company	Low
	Hafafet	34° 40' 00	24° 38' 00	Active	Individual	Low

Building Materials

Material	Location	E	N	Concession	Company	Economic Value
Gravel	West El Gemal	35° 04' 00	24° 40' 00	Stopped	—	Low

Decorative Stone

Material	Location	E	N	Concession	Company	Economic Value
White Granite	Gebal el-Abyad	34° 54' 00	24° 25' 00	Active	Individual	Moderate
		34° 51' 12	24° 27' 20	Active	Individual	Moderate
		34° 51' 57	24° 26' 16	Active	Individual	Moderate
		34° 52' 03	24° 25' 47	Active	Individual	Moderate
		34° 52' 34	24° 24' 56	Active	Individual	Moderate
		34° 53' 38	24° 24' 32	Active	Individual	Moderate
		34° 54' 44	24° 24' 20	Active	Individual	Moderate
Black Granite	Gebal el-Abyad	34° 59' 32	24° 23' 17	Active	Individual	Moderate

Precious Stones

Material	Location	E	N	Concession	Company	Economic Value
Beryl	Sikait	34° 47' 00	24° 40' 00	Stopped	—	Low
	Nugrus	34° 47' 00	24° 37' 00	Stopped	—	Low
	Um Rasheed	34° 45' 00	24° 39' 00	Stopped	—	Low
	Um Lasaf	34° 43' 23	24° 46' 26	Stopped	—	Low

Appendix 3: Preliminary Survey of Mining and Quarrying Activities, March 2003

1. **The abandoned talc mine at Wadi Qulan el-Atshan** (Lat: 24° 16' 00", Long: 35° 13' 00") destroys the whole landscape of two large areas. Excavations and heaps of waste materials occur everywhere in the area. Some wadis are completely dammed with the discarded materials. Remains of housing, machines, and iron are scattered throughout the area. Note that the quality and quantity of the ore did not merit this destruction.
2. **An abandoned talc mine lies near the quartz mine at Wadi Zabara** (Lat: 24° 48' 20", Long: 34° 43' 44"). Some excavations are scattered throughout the area.
3. **Abandoned talc mines of Wadi el-Lawy** (Lat: 24° 46' 09", Long: 34° 47' 44"). All mines are in a small tributary of Wadi el-Lawy. Excavations with some remnants of rock fragments are widely distributed in the area. Some remnants of old dwellings remain near the abandoned mines.
4. **Active vermiculite mine at Gabal Hafafet** (Lat: 24° 49' 00", Long: 34° 30' 00") along Sheikh Salem–Sheikh Shazly road (Road mark 78 km). Excavations widely distributed in a large area between Gabal Meghef and Gabal Hafafet. Remains of housing, machines, and garbage evident in the area. Only a few peoples are still working in the mine.
5. **Working ilmenite mine at Wadi Abu Ghalaka–Wadi Abu Ghsoon** (Lat: 24° 21' 18", Long: 35° 04' 07"): The ore occurs as large lenses a few meters long in metavolcanic rocks. Piles of the ore and overburden materials are widely distributed in the nearby wadis.
6. **Abandoned quartz mine at Wadi Zabara** (Lat: 24° 48' 20", Long: 34° 43' 44"): Quartz fragments are widely distributed in the wadi around the mine. Quartz occurs as a vein in metavolcanic rocks. A few excavations are evident.
7. **Abandoned quartz mine at Wadi el-Gemal** (Lat: 24° 37' 31", Long: 35° 01' 46"): Quartz occurs as a vein in metavolcanic rocks. Rushing water has removed all quartz fragments from the wadi and deposited them in a sheltered area behind the mine.
8. **Working feldspar mines at Hafafet**. The ore occur as small veins in granite rocks. Excavations and remaining materials are widely distributed in the area. The ore and its waste dam some wadis. The bad quality of the ore does not merit the destruction that occurred in the area.
9. **Abandoned feldspar mines at the historic site of Wadi Ghazal**. There are a few excavations to the north of a large Roman site. Feldspar and quartz rock fragments still remain around the excavations.
10. **Abandoned feldspar mines at Kab Marfoaa** at the northern side of Wadi el-Gemal (Lat: 24° 31' 22"N, Long: 34° 37' 04"E). Feldspar occurs as a small vein rich with

quartz in granite rocks. A few excavations are evident in the area. The abundance of quartz in the vein makes it unsuitable for feldspar mining. With the exception of the excavations, the landscape of the area is fascinating. The site lies between Gabal Museraibe in the south and Gabal Mukhatata in the east. An historic Roman site is close by as well.

11. **Beryl mines at Gabal Nugrus** (Lat: 24° 36' 58", Long: 34° 46' 34"). It is a historic mine just at the Roman village of Nugrus. Remnants of the Roman village are scattered up the mountain. Beryl mines are worked as excavations, which are surrounded by rock fragments and the waste. Unfortunately, white spots (probably used for ore evaluation) cover the whole historic area. The Nuclear Materials Authority is evaluating the ore in the area and has a large camp close to this site.
12. **Beryl mines at Wadi Sikait** (Lat: 24° 39' 35", Long: 34° 47' 41"). Similar to those at Gabal Nugrus, these mines are historic and lie close to the Roman village and temple and temple at Sikait. Beryl Mines are worked as excavations and there are big holes in the area surrounded by rock fragments and the waste materials. Unfortunately, the white spots, similar to those found at Nugrus mines, also occur, but in lesser amounts.
13. **Beryl mines of Gabal Zabara at Wadi Um Lasaf** (Lat: 24° 46' 26", Long: 34° 43' 23"). Similar to those at Gabal Nugrus and Sikait, these mines are historic and lie close to the Roman village in the area. Beryl Mines are worked as excavations and there are big holes in the area. Rock fragments from the excavations are piled at the foot of the mountain. People sometimes look for beryls in these piles. Unfortunately, the white spots, similar to those at Nugrus mines, also occur, but at a lesser degree.
14. **Granite quarries at Gabal el-Abyad:** (some of them are still working): A lot of white granite quarries at Gabal el-Abyad are widely distributed along Wadi Shawab. They destroy the whole landscape of the area along the track of Wadi Shawab. The quarries are recorded in the following sites (Lat: 24° 27' 20", Long: 34° 51' 12"), (Lat: 24° 26' 16", Long: 34° 51' 57"), (Lat: 24° 25' 47", Long: 34° 52' 03"), (Lat: 24° 24' 56", Long: 34° 52' 34"), (Lat: 24° 24' 32", Long: 34° 53' 38"), (Lat: 24° 24' 20", Long: 34° 54' 44"). These quarries have been worked using primitive and destructive methods, leaving many rock fragments behind. A lot of granite was lost in the working. Red bricks, remnants of machines, and garbage litter the area.
15. **Black granite quarry at the end of Wadi Shawab:** Most granite of Gabal el-Abyad is white except for this site (Lat: 24° 23' 17", Long: 34° 59' 32"). This black granite quarry constitutes only a small part in the area (less than 100 m wide). Blocks of granite are scattered at the foot of the mountain.

Appendix 4: Marine Algae Reported in WGNP

Latin Name	Latin Name
<i>Acanthophora nagadiiformis</i>	<i>Gelidium pusillum</i>
<i>Actinotrichia fragilis</i>	<i>Gracilaria caccalia</i>
<i>Amphiroa fragiissima</i>	<i>Gracilaria arcuata</i>
<i>Caulerpa racemosa</i>	<i>Halimeda macroloba</i>
<i>Caulerpa serrulata</i>	<i>Halimeda opuntia</i>
<i>Centroceras clavulatum</i>	<i>Herposiphonia tenella</i>
<i>Ceramium gracillimum</i>	<i>Hydroclathrus clathrus</i>
<i>Ceramium nayalii</i>	<i>Hypnea cornuta</i>
<i>Chaetomorpha aerea</i>	<i>Jania rubens</i>
<i>Chaetomorpha linum</i>	<i>Laurancia papillosa</i>
<i>Champia irregularis</i>	<i>Leveillea jungermannioides</i>
<i>Chondria collinsiana</i>	<i>Liagora farinosa</i>
<i>Cladophora crystallina</i>	<i>Lobophora variegata</i>
<i>Cladophora dalmatica</i>	<i>Lyngba sp.</i>
<i>Cladophoropsis zollingeri</i>	<i>Padina pavonica</i>
<i>Crouania attenuata</i>	<i>Peyssonelia rubra</i>
<i>Cystoseira myrica</i>	<i>Polysiphonia figariana</i>
<i>Cystoseira trinoides</i>	<i>Polysiphonia gorgoniae</i>
<i>Dictyosphaeria cavernosa</i>	<i>Porolithon onkodes</i>
<i>Dictyota dichotoma</i>	<i>Rockyivularia polyotis</i>
<i>Digenea simplex</i>	<i>Spermothamnion investiens</i>
<i>Endosiphonia clavigera</i>	<i>Spridia filamentosa</i>
<i>Enteromorpha clatherata</i>	<i>Trichogloea requienii</i>
<i>Enteromorpha flexuosa</i>	<i>Turbinaria elatensis</i>
<i>Erythrotrichia carnea</i>	<i>Turbinaria triquetra</i>
<i>Fostiella farinosa</i>	<i>Valonia aegagropila</i>
<i>Galaxaura cylindrica</i>	<i>Valonia macrophysa</i>
<i>Galaxaura rugosa</i>	<i>Valonia ventricosa</i>
<i>Gelidiella acerosa</i>	
<i>Laurancia obtusa</i>	

Appendix 5: Terrestrial Flora Recorded in WGNP

Perennial Plant Species

Status Key: cc=very common, c=common, r=rare, rr=very rare

Latin Name	الأسم العربي	Status
<i>Acacia ebrnbergiana</i>	سلم	c
<i>Acacia mellifera</i>	خشب	rr
<i>Acacia raddiana</i>	طلح	c
<i>Achillea fragrantissima</i>	جيسوم	c
<i>Adiantum capillus-veneris</i>	كزبرة البير	rr
<i>Aeluropus lagopoides</i>	حنجنيين	c
<i>Aerva javanica</i>	طرف	c
<i>Arthrocnemum macrostachyum</i>	خريزه	c
<i>Atriplex farinosa</i>	حوا/ هندال	c
<i>Avicennia marina</i>	شورى / مانجروف	r
<i>Balanites aegyptiaca</i>	الللوب / الهجليج	c
<i>Calligonum polygonoides</i>	أرطا	rr
<i>Calotropis procera</i>	عشار	c
<i>Capparis decidua</i>	تندب	r
<i>Capparis spinosa</i>	لصف	c
<i>Caylusea hexagyna</i>	دينبان	c
<i>Chozophora tinctoria</i>	غبيرة	r
<i>Citrullus colocynthis</i>	حنظل	c
<i>Cleome amblyocarpa</i>	سمو	r
<i>Cleome droserifolia</i>	عفين	c
<i>Convolvulus hystrix</i>	شيريم	rr
<i>Cotula cinerea</i>	أربيان	
<i>Crotalaria aegyptiaca</i>	ننش	r
<i>Cyperus conglomeratus</i>	سعد	c
<i>Erodium laciniatum</i>	أبو مصفى	c
<i>Euphorbia granulata</i>	الدينة	r
<i>Fagonia sp.</i>	شوكه	cc
<i>Farsetia aegyptia</i>	جرايبي	cc
<i>Farsetia longisiliqua</i>	دهيان	r
<i>Ficus palmata</i>	حماط	rr
<i>Ficus salicifolia</i>	ام سيسي	rr
<i>Forsskaolea tenacissima</i>	لساك	r
<i>Heliotropium strigosum</i>	مكور	r
<i>Hyphaene thebaica</i>	نخيل الدوم	c
<i>Juncus rigidus</i>	سمر	c

Latin Name	الأسم العربي	Status
<i>Kickxia nubica</i>	---	rr
<i>Launaea spinosa</i>	قداد	r
<i>Leptadenia pyrotechnica</i>	مرخ	r
<i>Limonium axillare</i>	شليل	c
<i>Lindenbergia abyssinica</i>	منهه هندي	rr
<i>Lontononis platycarpa</i>	حربيت	r
<i>Lotus deserti</i>	---	r
<i>Lycium shawii</i>	عوجز	c
<i>Maerna crassifolia</i>	سرحه	rr
<i>Moringa peregrina</i>	اليسار	rr
<i>Neurada procumbens</i>	لزيق	r
<i>Nitraria retusa</i>	غردق	c
<i>Ochradenus baccatus</i>	قرصي-تنبان	c
<i>Panicum turgidum</i>	أبو ركبة	c
<i>Pergularia tomentosa</i>	غلق	r
<i>Phoenix dactylefra</i>	نخيل البلح	c
<i>Phragmites australis</i>	بوص / غاب	c
<i>Pulicaria crispa</i>	قصوم	c
<i>Pulicaria incisa</i>	ربل	r
<i>Rhus oxycantha</i>	زعرور	rr
<i>Rumex cyprinus</i>	حمض	r
<i>Salvadora persica</i>	الأراك	r
<i>Schismus barbatus</i>	بهمه	c
<i>Senecio glaucus</i>	مرار	r
<i>Senna alexandrina</i>	سنامكي	c
<i>Solenostemma argel</i>	حرجل	r
<i>Stipagrostis ciliata</i>	حميرة	r
<i>Stipagrostis plumosa</i>	حشيش	r
<i>Sueda monoica</i>	سويدة / عسل	r
<i>Tamarix aphylla</i>	أثل	cc
<i>Tamarix nilotica</i>	طرفة	cc
<i>Tephrosia purpurea</i>	نفل	r
<i>Trichodesma africana var. homotrichum</i>	شوك الضب	r
<i>Zilla spinosa</i>	سيلا	cc
<i>Ziziphus spina-christi</i>	النبق / السدر	c
<i>Zygophyllum album</i>	رطريط	cc
<i>Zygophyllum berenicense</i>	---	rr
<i>Zygophyllum coccineum</i>	بطباط	cc

Ephemeral Plant Species

Status Key: cc=very common, c=common, r=rare, rr=very rare

Latin Name	الأسم العربي	Status
<i>Aizoon canariense</i>	الدع	r
<i>Arnebia hispidissima</i>	فيبي	c
<i>Asphodelus fistulosus</i>	بصل ابليس	r
<i>Astragalus eremophilus</i>	مجد	r
<i>Astragalus vogeli</i>	قرن	c
<i>Filago spatulata</i>	—	r
<i>Ifloga spicata</i>	خريشه الجدي	r
<i>Maha parviflora</i>	خبيزه	cc
<i>Neurada procumbens</i>	لسيق	c
<i>Plantago ciliate</i>	حلاوه البدن	c
<i>Schoumia thebaica</i>	مهد	cc
<i>Senecio desfontainei</i>	قريص	cc
<i>Senecio flavus</i>	حدديد	c
<i>Spergula fallax</i>	—	r
<i>Spergularia diandra</i>	قياقيلة	c
<i>Spergularia marina</i>	—	c
<i>Trautthema crystallina</i>	اراريب	rr
<i>Tribulus longipetalus</i>	قتوب	c
<i>Tribulus orientalis</i>	دريس	r
<i>Tribulus pentandrus</i>	—	c
<i>Trichodesma crystalline</i>	—	r
<i>Zygophyllum simplex</i>	رطريط	c

Appendix 6: Species of Stony Coral in WGNP

Latin Name	Latin Name
<i>Acanthastrea maxima</i>	<i>Leptastrea inaequalis</i>
<i>Acropora clathrata</i>	<i>Leptastrea transversa</i>
<i>Acropora cytherea</i>	<i>Leptoseris explanata</i>
<i>Acropora digitifera</i>	<i>Leptoseris hawaiiensis</i>
<i>Acropora eurystoma</i>	<i>Lobophyllia corymbosa</i>
<i>Acropora granulosa</i>	<i>Millepora dichotoma</i>
<i>Acropora hemprichii</i>	<i>Millepora exaesa</i>
<i>Acropora humilis</i>	<i>Millepora platyphylla</i>
<i>Acropora hyacinthus</i>	<i>Montastrea curta</i>
<i>Acropora pharaonis</i>	<i>Montipora aequituberculata</i>
<i>Acropora robusta</i>	<i>Montipora danae</i>
<i>Acropora squarrosa</i>	<i>Montipora informis</i>
<i>Acropora valida</i>	<i>Montipora monasteriata</i>
<i>Alveopora spongiosa</i>	<i>Montipora tuberculosa</i>
<i>Alveopora tizardi</i>	<i>Oulophyllia crispa</i>
<i>Astreopora myriophthalma</i>	<i>Oxypora lacera</i>
<i>Blastomussa merleti</i>	<i>Pavona cactus</i>
<i>Ctenactis echinata</i>	<i>Pavona diffluens</i>
<i>Cycloseris patelliformis</i>	<i>Pavona duerdeni</i>
<i>Cyphastrea serailia</i>	<i>Pavona maldivensis</i>
<i>Diploastrea heliopora</i>	<i>Platygyra daedalea</i>
<i>Echinophyllia aspera</i>	<i>Platygyra Phrygia</i>
<i>Echinopora fruticulosa</i>	<i>Plerogyra sinuosa</i>
<i>Favia fava</i>	<i>Pocillopora damicornis</i>
<i>Favia laxa</i>	<i>Pocillopora verrucosa</i>
<i>Favia stelligera</i>	<i>Podabacia crustacea</i>
<i>Favites complanata</i>	<i>Porites lobata</i>
<i>Favites flexuosa</i>	<i>Porites lutea</i>
<i>Favites peresi</i>	<i>Porites nodifera</i>
<i>Fungia (Danafungia) horrida</i>	<i>Psammocora explanulata</i>
<i>Fungia (Fungia) fungites</i>	<i>Psammocora haimeana</i>
<i>Fungia (Pleuractis) scutaria</i>	<i>Seriatopora hystrix</i>
<i>Galaxea fascicularis</i>	<i>Siderastrea savignyana</i>
<i>Gardineroseris planulata</i>	<i>Stylocoeniella guentheri</i>
<i>Goniopora columna</i>	<i>Stylophora pistillata</i>
<i>Goniopora somaliensis</i>	<i>Stylophora wellsii</i>
<i>Goniopora stokesi</i>	<i>Symphyllia erythraea</i>
<i>Herpolitha limax</i>	<i>Tubastraea coccinea</i>
<i>Hydnophora exesa</i>	<i>Tubastraea micranthus</i>
<i>Hydnophora microconos</i>	<i>Tubipora musica</i>

Appendix 7: Soft Coral Species in WGNP

Latin Name
<i>Heteroxenia sp.</i>
<i>Nephthya albida</i>
<i>Nephthya sp.</i>
<i>Parerythropodium fulvum</i>
<i>Sarcophyton eberenbergi</i>
<i>Sarcophyton sp.</i>
<i>Simularia sp.</i>
<i>Xenia farauensis</i>
<i>Xenia impulsatilla</i>
<i>Xenia macrospiculata</i>
<i>Xenia sp.</i>

Appendix 8: Gastropod Species in WGNP

Latin Name	Latin Name
<i>Acanthopleura baddoni</i>	<i>Nassarius auricularius</i>
<i>Anadra antiquata</i>	<i>Nassarius coronatus</i>
<i>Barbatia helblingi</i>	<i>Nassarius protrusidens</i>
<i>Brachidontes variabilis</i>	<i>Nembrotha affinis</i>
<i>Brechites attrabens</i>	<i>Nerita albicilla</i>
<i>Cardila verigata</i>	<i>Nerita polita</i>
<i>Cellana eucosmia</i>	<i>Nerita polita</i>
<i>Cerithium caeruleum</i>	<i>Nerita undata</i>
<i>Cerithium erythraeonense</i>	<i>Octopus vulgaris</i>
<i>Chama pacifica</i>	<i>Patella species</i>
<i>Chicoreus virgineus</i>	<i>Pinctada margaritifera</i>
<i>Chiton species</i>	<i>Pinctada radiata</i>
<i>Chromodoris annulata</i>	<i>Pleuroploca filamentosa</i>
<i>Chromodoris fidelis</i>	<i>Polinices tumidus</i>
<i>Circe corrugata</i>	<i>Rockyhinoclavis fasciatus</i>
<i>Circentia arabica</i>	<i>Sanbaliotus pustulata</i>
<i>Clanculus pharoanis</i>	<i>Sanbaliotus varia</i>
<i>Conus arenatus</i>	<i>Sepia pharoans</i>
<i>Conus frigidus</i>	<i>Septoteuthis lessoniana</i>
<i>Conus namocanus</i>	<i>Spondylus histrix</i>
<i>Conus taeniatus</i>	<i>Spondylus marisrubri</i>
<i>Conus tessulatus</i>	<i>Stomata auricula</i>
<i>Conus textile</i>	<i>Stomata nigra</i>
<i>Conus vigro</i>	<i>Streptopinna saccata</i>
<i>Ctena divergens</i>	<i>Strombus decorus</i>
<i>Cypraea carneola</i>	<i>Strombus fasciatus</i>
<i>Cypraea grayana</i>	<i>Strombus fusiformis</i>
<i>Cypraea nebrites</i>	<i>Strombus gabberulus</i>
<i>Cypraea pantheriana</i>	<i>Strombus mutabilis</i>
<i>Cypraea pluchra</i>	<i>Stylocheilus species</i>
<i>Dendropoma maxima</i>	<i>Tectus dentatus</i>
<i>Drupa ricinus</i>	<i>Tectus variegatus</i>
<i>Engina mendicaria</i>	<i>Tellina inflata</i>
<i>Fusus polygonoides</i>	<i>Tellinella staurilla</i>
<i>Gafrarium pectinata</i>	<i>Terebra affinis</i>
<i>Harpa amouretta</i>	<i>Terebra consobrina</i>
<i>Hiatula rupelliana</i>	<i>Terebra crenulata</i>
<i>Hytissa hyotis</i>	<i>Thais savignyi</i>

Latin Name
<i>Hyotissa numisma</i>
<i>Lambis triuncata</i>
<i>Latirus turrilus</i>
<i>Littorina scabra</i>
<i>Lunulicardia auricula</i>
<i>Modulus auriculatus</i>
<i>Monodonta canilifera</i>
<i>Morula granulata</i>
<i>Murex tribulus</i>
<i>Muricodurpa fuscillum</i>

Latin Name
<i>Tonna perdx</i>
<i>Tridacna maxima</i>
<i>Tridacna sp.</i>
<i>Tridacna squamosa</i>
<i>Trochus maculatus</i>
<i>Turbo pustulatus</i>
<i>Turbo radiatus</i>
<i>Vasum turbinellus</i>
<i>Vermetus species</i>
<i>Volema pyrurum</i>

Appendix 9: Echinoderm Species in WGNP

Latin Name	Latin Name
<i>Acanthaster planci</i>	<i>Holothuria leucospilota</i>
<i>Actinopyga mauritiana</i>	<i>Linckia guildingi</i>
<i>Actinopyga plebeja</i>	<i>Linckia multifora</i>
<i>Asterina burtoni</i>	<i>Macrophiothrix galateae</i>
<i>Astropyga radiata</i>	<i>Oligometra serripinna</i>
<i>Bobadschia cousteaui</i>	<i>Opheodesoma kamaranensis</i>
<i>Bobadschia steinitzi</i>	<i>Ophiactis savignyi</i>
<i>Capillaster multiradiatus</i>	<i>Ophiocoma erinaceus</i>
<i>Chaetodiadema granulatum</i>	<i>Ophiocoma pica</i>
<i>Diadema savignyi</i>	<i>Ophiocoma scolopendrina</i>
<i>Diadema setosum</i>	<i>Ophiocoma valenciae</i>
<i>Echinaster purpureus</i>	<i>Ophiodaphne scripta</i>
<i>Echinometra mathaei</i>	<i>Ophiolepis cincta</i>
<i>Echinosterophus molaris</i>	<i>Ophiomastix variabilis</i>
<i>Echinothrix calamaris</i>	<i>Ophionereis porrecta</i>
<i>Echinothrix diadema</i>	<i>Ophiopeza fallax fallax</i>
<i>Eucidaris metularia</i>	<i>Ophiura kinbergi</i>
<i>Fromia monilis</i>	<i>Prionocidaris baculosa</i>
<i>Heterocentrotus mammillatus</i>	<i>Stichopus variegatus</i>
<i>Holothuria arenicola</i>	<i>Synapta maculata</i>
<i>Holothuria atra</i>	<i>Tripneustes gratilla</i>
<i>Holothuria difficilis</i>	

Appendix 10: Fish Species Reported in WGNP

Latin Name	Latin Name
<i>Abudefduf saxatilis</i>	<i>Grammistes sexlineatus</i>
<i>Acanthopagrus bifasciatus</i>	<i>Halichoeres nebulosus</i>
<i>Acanthopagrus berda</i>	<i>Hemigymnus fasciatus</i>
<i>Acanthurus nigricans</i>	<i>Hemiramphus far</i>
<i>Acanthurus nigrofuscus</i>	<i>Heniochus diphreutes</i>
<i>Acanthurus sobal</i>	<i>Heniochus intermedius</i>
<i>Adioryx ruber</i>	<i>Istiblennius edentulus</i>
<i>Adiotyx diadema</i>	<i>Istiblennius periophthalmus</i>
<i>Aethaloperca rogae</i>	<i>Istigobius ornatus</i>
<i>Amblyeleotris sungami</i>	<i>Lutjanus bohar</i>
<i>Amphiprion bicinctus</i>	<i>Lutjanus ehrenbergi</i>
<i>Anthias squamipinnis</i>	<i>Lutjanus fulviflamma</i>
<i>Arothron diadematus</i>	<i>Lutjanus Kasmira</i>
<i>Arothron hispidus</i>	<i>Megaprotodon trifascialis</i>
<i>Atherinomorus lacunosus</i>	<i>Monodactylus argenteus</i>
<i>Bothus pantherinus</i>	<i>Mulloides flavolineatus</i>
<i>BothusBothus pantherinus</i>	<i>Naso lituratus</i>
<i>Caesio lunaris</i>	<i>Naso unicornis</i>
<i>Caesio suericus</i>	<i>Odonus niger</i>
<i>Carangoides fulvoguttatus</i>	<i>Oxycirrhites typus</i>
<i>Caranx melampygus</i>	<i>Paraglyphidodon melas</i>
<i>Carcharhinus wheeleri</i>	<i>Pardachirus marmoratus</i>
<i>Carngoides bayad</i>	<i>Parupeneus cyclostoma</i>
<i>Cephalopholis hemistiktos</i>	<i>Parupeneus cyclostomus</i>
<i>Cephalopholis miniata</i>	<i>Parupeneus forsskali</i>
<i>Cetoscarus bicolor</i>	<i>Pempheris vanicolensis</i>
<i>Chaetodon auriga</i>	<i>Platax orbicularis</i>
<i>Chaetodon austriacus</i>	<i>Plectorhynchus gaterinus</i>
<i>Chaetodon fasciatus</i>	<i>Pomacanthus maculosus</i>
<i>Chaetodon paucifasciatus</i>	<i>Pseudochromis flavivertex</i>
<i>Cheatodon auriga</i>	<i>Pterois radiata</i>
<i>Cheilinus sp.</i>	<i>Pterois volitans</i>
<i>Cheilinus undulatus</i>	<i>Pygoplites diacanthus</i>
<i>Cheilnus fasciatus</i>	<i>Restrelliger kanagurta</i>
<i>Cheilodipterus macrodon</i>	<i>Rhabdosargus sarba</i>
<i>Chromis caerulea</i>	<i>Rhinecanthus assasi</i>
<i>Chromis dimidiata</i>	<i>Rhinobatus sp</i>
<i>Chrysiptera annulata</i>	<i>Scarus psittacus</i>

Latin Name	Latin Name
<i>Conger cinereus</i>	<i>Scarus sordidus</i>
<i>Crenimugil crenilabis</i>	<i>Scorpaenopsis barbatus</i>
<i>Ctenochaetus striatus</i>	<i>Scorpaenopsis diabolus</i>
<i>Ctenogobiops maculasis</i>	<i>Siganus rivulatus</i>
<i>Ctenogobiops maculosis</i>	<i>Siganus stellatus</i>
<i>Dascyllus aruanus</i>	<i>Synodus variegatus</i>
<i>Dascyllus marginatus</i>	<i>Taeniura lymma</i>
<i>Dascyllus trimaculatus</i>	<i>Terapon jarbua</i>
<i>Diodon hystrix</i>	<i>Thalassoma purpureum</i>
<i>Fistularia commersonii</i>	<i>Trachyrhynchus bicoarctatus</i>
<i>Flammeo sammara</i>	<i>Tylosurus Choram</i>
<i>Gerres oyena</i>	<i>Zebrasoma desjardini</i>
<i>Gnatholepis anjerensis</i>	<i>Zebrasoma veliferum</i>
<i>Gomphosus coeruleus</i>	<i>Zebrasoma xanthurum</i>

Appendix 11: Reptile Species in WGNP

Latin Name	الاسم العربي	English Name
<i>Cyrtopodion scabrum</i>	برص خشن	Rough scaled Gecko
<i>Hemidactylus robustus</i>	برص البحر الأحمر	Somali Plain Gecko
<i>Hemidactylus turcicus</i>	برص تركي	Turkish Gecko
<i>Pristurus flavipunctatus</i>	برص الشجر	Yellow-spotted Semaphore Gecko
<i>Ptyodactylus hasselquistii</i>	برص أبو كف	Hasselquest's Fan-toed Gecko
<i>Ptyodactylus siphonorhina</i>	برص أبو كف	Anderson's Fan-toed Gecko
<i>Stenodactylus sthenodactylus</i>	برص أبو عين واسعة	Elegant Gecko
<i>Tarentola annularis</i>	برص مصري	Egyptian Gecko
<i>Tropicolotes bisbaricus</i>	برص بشاري قزم	Bishari Pygmy Gecko
<i>Tropicolotes steudneri</i>	برص تحت الحجر	Steudner's Pygmy Gecko
<i>Agama spinosa</i>	حردون البحر الأحمر	Spiny Agama
<i>Pseudotrapelus sinaitus</i>	حردون سيناء	Sinai Agama
<i>Uromastix ocellata</i>	ضب مزوق	Oscillated Dab Lizard
<i>Acanthodactylus boskianus</i>	سحلية بوسك	Bosc's Fringe-toed Lizard
<i>Acanthodactylus scutellatus</i>	سحلية	Nidua Lizard
<i>Mesalina guttulata</i>	سحلية صغيرة النقط	Small-spotted Lizard
<i>Mesalina rubropunctata</i>	سحلية حمراء النقط	Red-spotted Lizard
<i>Varanus griseus</i>	ورل صحراوي	Desert Monitor
<i>Chalcides ocellatus</i>	سقفور منقط	Oscillated Skink
<i>Coluber rhodorhachis</i>	سف رمادي	Jan's Racer
<i>Psammophis aegyptius</i>	أبو السيور الصحراوي	Saharn Sand Snake
<i>Psammophis schokari</i>	أبو السيور المخطط	Schokari Sand Snake
<i>Spalerosophis diadema</i>	أرقم أحمر	Clifford's Snake
<i>Malpolon moilensis</i>	ثعبان	Moila Snake
<i>Telescopus dbara</i>	ثعبان جداري	Cat snake
<i>Cerastes cerastes</i>	طريشة	Horned viper
<i>Echis coloratus</i>	أفعى منشارية	Carpet Viper
<i>Chelonia mydas</i>	السلاحفة البحرية الخضراء	Green Turtle
<i>Eretmochelys imbricata</i>	السلاحفة الصقرية	Hawksbill Turtle

Appendix 12: Breeding Bird Species in WGNP

Latin Name	الاسم العربي	English Name
<i>Phaethon aethereus</i>	رئيس البحر	Red-billed Tropic Bird
<i>Sula leucogaster</i>	أطيش	Brown Booby
<i>Egretta gularis</i>	بلشون الصخر	Western Reef Heron
<i>Ardea goliath</i>	بلشون جبار	Goliath Heron
<i>Butorides striatus</i>	بلشون أخضر	Striated Heron
<i>Platalea leucorodia</i>	أبوملعة	Spoonbill
<i>Buteo rufinus</i>	صقر حوام	Long-legged Buzzard
<i>Hieraaetus fasciatus</i>		Bonelli's Eagle
<i>Pandion haliaetus</i>	عقاب نسارية	Osprey
<i>Neophron percnopterus</i>	رخمة مصرية	Egyptian Vulture
<i>Gypaetus barbatus</i>		Lammergeyer
<i>Torgos tracheliotus</i>	نسر أذن	Lappet-faced Vulture
<i>Falco biarmicus</i>	صقر حر	Lanner Falcon
<i>Falco concolor</i>	صقر الغروب	Sooty Falcon
<i>Ammoperdix heyi</i>	حجل الصخر	Sand Partridge
<i>Pterocles lichtensteini</i>	قطا نوبي	Lichtenstein's Sandgrouse
<i>Pterocles coronatus</i>	قطا متوج	Crowned Sandgrouse
<i>Pterocles senegallus</i>	قطا أنقط	Spotted Sandgrouse
<i>Streptopelia senegalensis</i>	يمام بلدي	Palm Dove
<i>Streptopelia decaocto</i>	يمام مطوق	Collard Dove
<i>Streptopelia roseogrisea</i>	يمام وردي	Pink-headed Dove
<i>Columba livia</i>	يمام جبلي	Rock Dove
<i>Larus hemprichii</i>	نورس أسحم	Sooty Gull
<i>Larus leucophthalmus</i>	نورس عجمة	White-eyed Gull
<i>Sterna repressa</i>	خطاف أبو بطن	White-cheeked Tern
<i>Sterna caspia</i>	خطاف أبولحة	Caspian Tern
<i>Sterna bengalensis</i>	خطاف متوج	Lesser Crested-Tern
<i>Sterna anaethetus</i>	خطاف أسحم	Bridled Tern
<i>Charadrius alexandrinus</i>	قطقاط أسكندري	Kentish Plover
<i>Burhinus oedicephalus</i>	كروان صحراوي	Stone Curlew
<i>Cursorius cursor</i>	جليل	Cream-colored Courser
<i>Strix butleri</i>	بومة بتلر	Hume's Tawny Owl
<i>Bubo ascalaphus</i>	بعفة الصحراء	Pharao's Eagle Owl
<i>Ammomanes cincturus</i>	قنبرة صحراوية موشمة الذيل	Bar-tailed Desert Lark
<i>Ammomanes deserti</i>	قنبرة صحراوية	Desert Lark
<i>Alaemon alaudipes</i>	مكاء	Hoopoe Lark
<i>Hirundo obsoleta</i>	خطاف الصخر	Rock Martin

Latin Name	الاسم العربي	English Name
<i>Oenanthe lugens</i>	أبلق حزين	Mourning Wheatear
<i>Oenanthe monacha</i>	أبلق أبو قلنسوة	Hooded Wheatear
<i>Oenanthe leucopyga</i>	أبلق متوج	White-crowned Black Wheatear
<i>Hippolais pallida</i>		Olivaceous Warbler
<i>Lanius meridionalis</i>	دقناش البادية	Southern Grey Shrike
<i>Corvus ruficollis</i>	غراب نوحى	Brown-necked Raven
<i>Emberiza striolata</i>	بلبل الشعير المخطط	House Bunting
<i>Rhodopechys githagina</i>	زمير مصري	Trumpeter Finch

Appendix 13: Mammal Species in WGNP

Latin Name	الاسم العربي	English Name
<i>Tapbozous perforatus</i>	خفاش المقابر	Tomb Bat
<i>Tapbozous nudiventris</i>	خفاش	Egyptian Sheath-tailed Bat
<i>Asila tridens</i>	خفاش	Trident Horseshoe Bat
<i>Otonycteris hemprichii</i>	خفاش طويل الأذن	Hemprich's Long-eared Bat
<i>Tadarida aegyptiaca</i>	خفاش حر الذيل	Free-tailed Bat
<i>Paraechinus aethiopicus</i>	قنفذ صحراوي	Desert Hedgehog
<i>Lepus capensis</i>	أرنب بري	Cape Hare
<i>Gerbillus pyramidum</i>	بيوضي	Greater Gerbil
<i>Gerbillus gerbillus</i>	بيوضي	Lesser Gerbil
<i>Sekeetamys calurus</i>	جرذ ريشي الذنب	Bushy Tailed Jird
<i>Dipodillus henleyi</i>	بيوضي	Henley's Dipodil
<i>Meriones crassus</i>	جرذ	Silky Jird
<i>Acomys cabirinus</i>	فأر شوكي	Egyptian Spiny Mouse
<i>Mus musculus</i>	فأر المنزل	House Mouse
<i>Jaculus jaculus</i>	جربوع	Lesser Jerboa
<i>Felis margarita</i>	قط الرمال	Sand Cat
<i>Felis caracal</i>	أم الريشات	Caracal
<i>Vulpes rueppelli</i>	ثعلب الرمال	Rueppelle's Sand Fox
<i>Hyaena hyaena</i>	ضبع مخطط	Stripped Hyena
<i>Dugong dugon</i>	عروس البحر	Dugong
<i>Capra nubiana</i>	تيتل نوبي	Nubian Ibex
<i>Procavia capensis</i>	وبر	Hyrax
<i>Ammotragus lervia</i>	كباش ألروي	Barbary Sheep
<i>Gazella dorcas</i>	غزال مصري	Dorcas Gazelle
<i>Delphinus delphis*</i>	دولفين	Common Dolphine
<i>Tursiops truncatus</i>	دولفين	Bottel-nosed Dolphine
<i>Stenella longirostris</i>	دولفين	Spinner Dolphine
<i>Grampus griseus*</i>	دولفين	Risso's Dolphine

* Species expected to be found

Appendix 14: Archaeological Sites in and around WGPN

Modern Name	Ancient Name	Period	Coordinates	Brief Description
Dweig	Falacro	Early Roman	24° 44.15' N 34° 25.57' E	Road station near juncture of ancient Berenike–Edfu and Berenike–Koptos roads
Umm Gariyeh/ Umm Ushra	Unknown	Early Roman and probably Ptolemaic	24° 40.56' N 34° 32.61' E	Road station on ancient Berenike–Edfu/Koptos road
Wadi Gemal	Apollonos	1 st –6 th Century AD	24° 32.11' N 34° 44.15' E	Major fort on ancient route from Berenike to Nile (at Edfu and Koptos)
Between Wadi Gemal and Gelli/Wadi Gemal South	Unknown	Early and late Roman	24° 31.42' N 34° 44.20' E	Cemetery probably serving both wadis Gemal and Gelli/ Wadi Gemal South
Gelli/Wadi Gemal South	Unknown	1 st –2 nd and 5 th Centuries AD, and Islamic period	24° 31.25' N 34° 44.41' E	Major settlement of unknown function a few km south of Apollonos
Sikait*	Senskis/ Senskete	1 st –5 th Century AD and possibly Ptolemaic	24° 37.95' N 34° 47.73' E	Major beryl/ emerald mining settlement
Middle Sikait*	Unknown	1 st –2 nd and 4 th Centuries AD	24° 39.45' N 34° 48.30' E	Beryl/emerald mining center
North Sikait*	Unknown	5 th –6 th Centuries AD	24° 39.84' N 34° 47.50' E	Beryl/emerald mining settlement
Umm Hieran	Unknown	Late 4 th –early 6 th Centuries AD	24° 34.64' N 34° 51.67' E	About 190 structure site of unknown function, perhaps Christian laura settlement
Umm Harba*	Unknown	Early & late Roman	24° 38.53' N 34° 49.59' E	Beryl/emerald mining settlement
Kab Marfu'a/ Wadi Gemal North	Unknown	1 st and 2 nd –5 th Centuries AD	24° 32.61' N 34° 44.22' E	Perhaps beryl/ emerald processing center
Nugrus*	Unknown	Early and late Roman	24° 37.19' N 34° 46.39' E	Major beryl/ emerald mining settlement
Nugrus West	Unknown	Late 4 th –early 6 th Centuries AD	24° 37.14' N 34° 46.04' E	About 70–80 structures on site of unknown function, possibly Christian laura settlement
Abu Rushaid*	Unknown	Early Roman	24° 38.33' N 34° 45.88' E	Beryl/emerald mining settlement

Modern Name	Ancient Name	Period	Coordinates	Brief Description
Umm Kabu*	Unknown	Early Roman on, perhaps Ptolemaic	24° 35.35' N 34° 53.57' E	Beryl/emerald mining site
Gebel Zabara*	Unknown	Roman, Islamic	24° 46.27' N 34° 43.08' E	Beryl/emerald mining settlement
Wadi Duba**	Unknown	Late 1 st Century BC to early 1 st Century AD	24° 34.65' N 34° 53.93' E	Beryl/emerald mining settlement
Abu Hegilig North	Unknown	Late 4 th –6 th Centuries AD	24° 25.22' N 34° 55.46' E	Road station on ancient route from Berenike to Nile (at Edfu/Koptos)
Abu Hegilig South	Unknown	Early Roman, perhaps late Roman, perhaps Ptolemaic	24° 23.94' N 34° 59.48' E	Road station on ancient route from Berenike to Nile (at Edfu/Koptos)
Abu Ghalqa	Unknown	5 th –6 th Centuries AD	24° 20.95' N 35° 04.19' E	Road station on ancient route from Berenike to Nile (at Edfu/Koptos)
Qabr Rijm/Shea'leq/MkBea'/Abu Ghurbon	Unknown	Early & late Roman	24° 07.00' N 35° 16.34' E	Stop on Berenike– Nile road
Lahmi	Unknown	Ptolemaic, 1 st , 2 nd , and 4 th Centuries AD	24° 09.92' N 35° 21.81' E	Small fort
Juncture of Wadi Gemal and Wadi Nugrus	Unknown	Unknown	24° 34.47' N 34° 49.45' E	Animal tethering lines
Wadi Gemal East	Unknown	Mid-2 nd –4 th Centuries AD	24° 34.02' N 34° 48.97' E	Road station and settlement with animal tethering lines
Off ancient Via Hadriana	Unknown	Early Roman	24° 26.70' N 35° 04.63' E	Cemetery west of ancient Via Hadriana
Bir Rada	Unknown	Probably late Roman	24° 15.67' N 35° 14.49' E	Well and cemetery of about a dozen or more tombs/graves
Mweillah	Unknown	Ptolemaic–early Roman	24° 13.33' N 35° 03.98' E	Gold mining settlement
Wadi al-Ghadir (1)	Unknown	Late 4 th –6 th Centuries AD	24° 48.30' N 34° 50.52' E	Gold mining settlement
Wadi al-Ghadir (2)	Unknown	Probably Roman	24° 47.95' N 34° 50.49' E	Ancient tombs/graves
Umm Ud	Unknown	Early 20 th Century (British), possibly ancient	24° 48.71' N 34° 41.63' E	Gold mines
Helan	Unknown	Early and late Roman	24° 37.53' N 34° 34.92' E	Settlement off ancient Berenike– Nile road
Hangaliya	Unknown	Ptolemaic–Roman	24° 50.32' N 34° 35.89' E	Gold mining settlement
Khashir	Novum Hydreuma	Unknown	24° 11.06' N 35° 14.02' E	Station on ancient Berenike–Nile road

Modern Name	Ancient Name	Period	Coordinates	Brief Description
Abu Ghusoon	Cabalsi (?)	Late 4 th –5 th Centuries AD	24° 23.24' N 35° 02.87' E	Station on ancient Berenike–Nile road
Mouth of Wadi Ghadir	Unknown	Probably late Roman and modern Bedouin	24° 49.02' N 34° 59.73' E	Cemetery of about 37–40 graves
Umm Kebash	Unknown	1 st –4 th /5 th Centuries AD	24° 42.85' N 34° 28.20' E	Stop on ancient Berenike–Nile road
Kurdumay	Unknown	Roman and modern British reworking	24° 52.53' N 34° 41.58' E	Gold mining settlement of about 60 structures
Seyhrig	Unknown	Ptolemaic–early Roman and Islamic	24° 45.79' N 34° 18.90' E	Station on ancient Berenike–Nile road

* Sites in this region collectively known as Mons Smaragdus or “Emerald Mountain,” to the Romans.

Appendix 15: Status of Archaeological Sites in WGPN

Modern Name	Relative Significance	Status	Condition/Threats
Dweig	Important fort at juncture of ancient Berenike–Edfu/Koptos roads	Surveyed/plan drawn	Very well preserved/ vandalism/antiquities theft
Umm Qariyeh/Umm Ushra	Important fort on ancient Berenike–Edfu/Koptos roads	Surveyed/plan drawn	Very well preserved/ vandalism/antiquities theft
Wadi Gemal	Remains of largest Roman military fort in Eastern Desert	Surveyed/plan drawn	Mediocre, most of two walls washed away/ vandalism/antiquities theft/flooding
Between Wadi Gemal and Gelli/Wadi Gemal South	Cemetery of minor importance	Not surveyed, no plan drawn	Mediocre/vandalism/ antiquities theft/vehicle traffic
Gelli/Wadi Gemal South	Major and very large settlement	Not surveyed, no plan drawn, not excavated	Very good/vandalism/ antiquities theft/ vehicle traffic
Sikait	Major site in this zone, several hundred buildings, rock cut temples	Surveyed/plan drawn/ excavations begun	Very good to excellent/ theft/uncontrolled tourism/flooding
Middle Sikait	Important site with large ancient ramps, mining shafts, buildings	Partially surveyed	Very good/theft/ uncontrolled tourism/natural erosion
North Sikait	Important site with numerous buildings and mine shafts	Surveyed/plan drawn	Very good/vandalism/ theft
Umm Hieran	Site of secondary importance	Surveyed/plan drawn	Good/vandalism/theft
Umm Harba	Important site (less so than Sikait, more so than Umm Hieran)	Sketch plan drawn	Excellent/vandalism/ theft/uncontrolled tourism
Kab Marfu'a/ Wadi Gemal North	Major site with numerous well preserved buildings, temple on side of mountain	Partially surveyed and partial plan drawn	Excellent/vandalism/ theft/uncontrolled tourism/natural erosion
Nugrus	Major site in this zone with about two dozen buildings in superb condition, hundreds of others in ruins	Partially surveyed and partial plan drawn	Excellent/vandalism/ theft/ uncontrolled tourism/modern beryl mining/natural erosion
Nugrus West	Minor site of secondary important	Not surveyed, no plan drawn	Good/vandalism/theft

Modern Name	Relative Significance	Status	Condition/Threats
Abu Rushaid	Site of secondary importance	Not surveyed, no plan drawn	Good/vandalism/theft
Umm Kabu	Site of secondary importance	Not surveyed, no plan drawn	Good/vandalism/theft
Gebel Zabara	Important site	Not surveyed, no plan drawn	Good/vandalism/theft/uncontrolled tourism
Wadi Duba'	Site of minor importance	Not surveyed, no plan drawn	Poor/no real threats likely
Abu Hegilig North	Site of secondary importance	Surveyed, plan drawn	Excellent/vandalism/theft/uncontrolled tourism
Abu Hegilig South	Important site	Surveyed, plan drawn	Excellent/vandalism/theft/ nearby modern quarrying/ uncontrolled tourism
Abu Ghalqa	Minor site	Surveyed, plan drawn	Poor/no real threats likely
Qabr Rijm/Shea'leq/Mkbea'/Abu Ghurbon	Minor site, ancient camp, no real structures here	Not surveyed, no plan drawn	Poor/no real threats likely other than natural erosion
Lahmi	Important site	Surveyed, plan drawn	Very good/vandalism/theft/uncontrolled tourism
Juncture Wadi Gemal–Wadi Nugrus	Site of secondary importance	Surveyed, plan drawn	Good/flooding/vehicle traffic
Wadi Gemal East	Important site	Surveyed, plan drawn	Good/excellent/vandalism/theft/uncontrolled tourism/flooding/vehicle traffic
Off ancient Via Hadriana	Minor site	Not surveyed, no plan drawn	Good/vandalism/theft
Bir Rada	Minor site	Not surveyed, no plan drawn	Mediocre/vandalism/theft
Mweilah	Site of secondary importance	Sketch plan drawn	Good/vandalism/theft
Wadi al-Ghadir (1)	Site of secondary importance	Not surveyed, no plan drawn	Good/vandalism/theft
Wadi al-Ghadir (2)	Site of secondary importance	Not surveyed, no plan drawn	Good/vandalism/theft
Umm Ud	Site of secondary importance as an antiquity, but interesting example of early 20 th Century gold mine	Not surveyed, no plan drawn	Good/no real threats likely
Helan	Site of secondary importance	Surveyed, sketch plan drawn	Mediocre/vandalism/theft
Hangaliya	Important ancient gold mining settlement in this zone	Not surveyed, no plan drawn	Good/vandalism/theft
Khashir	Site of secondary importance	Surveyed, plan drawn	Mediocre/no real threats likely

Modern Name	Relative Significance	Status	Condition/Threats
Abu Ghusoon	Site of secondary importance in very poor state of preservation	Surveyed, plan drawn	Poor/nearby modern mining activity
Mouth of Wadi Ghadir	Site of minor importance	Not surveyed, no plan drawn	Mediocre/vandalism/theft
Umm Kebash	Site of minor importance, ancient camp, no standing structures	Not surveyed, no plan drawn	Poor/natural erosion
Kurdumay	Site of secondary importance	Not surveyed, no plan drawn	Mediocre-good/vandalism/theft
Seyhrig	Important secondary site	Surveyed, plan drawn	Good/vandalism/theft/natural erosion

Appendix 16: Proposed Accessibility to Archaeological Sites, with Management Recommendations

Site	Proposed Accessibility for Visitors
Dweig	Restricted
Umm Qariyeh/ Umm Ushra	Restricted
Wadi Gemal	Open
Between Wadi Gemal and Gelli/Wadi Gemal South	Open
Gelli/Wadi Gemal South	Restricted
Sikait	Restricted
Middle Sikait	Restricted
North Sikait	Restricted
Umm Heiran	Open
Umm Harba	Closed
Kab Marfu'a/Wadi Gemal North	Restricted
Nugrus	Restricted
Nugrus West	Open
Abu Rushaid	Restricted
Umm Kabu	Open
Gebel Zabara	Restricted
Wadi Duba'	Open
Abu Hegilig North	Restricted
Abu Hegilig South	Restricted
Abu Ghalqa	Open
Qabr Rijm/Shea'leq/ MkBea'/Abu Ghurbon	Open
Lahami	Restricted
Juncture Wadi Gemal– Wadi Nugrus	Restricted
Wadi Gemal East	Restricted
Off ancient Via Hadriana (cemetery)	Open
Bir Ria'da	Open
Mweillah	Restricted
Wadi al-Ghadir (1)	Restricted
Wadi al-Ghadir (2)	Restricted
Umm Ud	Open
Helan	Restricted
Hangaliya	Restricted
Khashir	Open
Abu Ghusoon	Restricted
Mouth of Wadi Ghadir	Open
Umm Kebash	Open
Kurdumay	Restricted
Seyhrig	Restricted

Management Recommendations

It is recommended that access to all the sites listed above as restricted be controlled. Fences, signs, and guards would limit access. Some sites might well require more stringent protection. These sites should have restricted access for vehicles, posted markers, designated paths from which visitors should not stray, and alert, omnipresent, and well-informed guards. Floodwater diversion schemes should also be established for some of these sites.

It is recommended that these sites have detailed, architect-quality measured plans and elevations of the most important structures drawn as soon as possible. In addition, it is essential that architectural consolidation/conservation/restoration be undertaken to arrest the effects of human and natural depredations at many sites.

The proposed status of the sites is not permanent, but should be adjusted so that most become more accessible once site plans, architectural elevation drawings, limited excavation, suggested architectural conservation/restoration, and the requisite protection have been completed/provided. The status of each of these sites may also be altered once protective measures have been instituted.

Appendix 17: Staffing Plan and Requirements for WGNP

Job Title	Position	Target Number	Distribution over Management Sectors			Brief Job Description
			North	South	Inland	
PA Manager	PA Manager	1	1			Overall responsibility for the coordination of WGNP management, ensuring that PA objectives are met and policies applied. Responsible for PAMU administration and performance; and plays a major liaison role with local government agencies and other local stakeholders. Reports to Red Sea PA manager.
PA Sector Manager	Senior Ranger	3	1	1	1	Responsible for daily management of the three Management Sectors; assists, reports to, and delegates for PA Manager; responsible for patrol schedules, equipment maintenance, communications, public relations/awareness, visitor management, and EIA enforcement.
Accountant	Ranger/ Junior Ranger	1	1			Responsible for financial planning, control, and reporting; payment schedules; PAMU inventories; and various office management and administrative duties.
Office Administrator	Ranger/ Junior Ranger	1	1			Assistant to PAMU Manager, responsible for office administration and general secretarial duties (file and office register system). Present incumbent to assist on legal affairs.
Legal Officer	Ranger/ Junior Ranger	1	1			Report violations to police and follow up prosecutions. Organize permit and licensing system for the PA.
IT/GIS Specialist	Ranger/ Junior Ranger	1	1			Development and maintenance of PAMU GIS database in coordination with Hurghada GIS unit, document spatial development (urban, quarries, tracks, etc.) in and around the PA, and assist with EIAs.

Job Title	Position	Target Number	Distribution over Management Sectors			Brief Job Description
			North	South	Inland	
Civil Engineer	Ranger/ Junior Ranger	1	1			Planning and supervision of PA infrastructure development and maintenance, track maintenance, monitoring of urban development, eco-lodge development, waste management, and assist with EIAs.
Marine Biologist	Ranger/ Junior Ranger	4	2	2		Will have responsibility for general and specific status surveys of target species and ecosystems; implementing biodiversity and ecological monitoring and management interventions; assist with EIAs in the marine and coastal environments.
Terrestrial Biologist	Ranger/ Junior Ranger	6	2	2	2	Will have major responsibility for general and specific status surveys of target species and ecosystems; implementing biodiversity and ecological monitoring and management interventions; assist with EIAs in the terrestrial environments.
Geologist	Ranger/ Junior Ranger	1			1	Planning and monitoring quarrying and mines, monitoring water quality and supplies, supervise well maintenance, wildlife water points, infrastructure ground engineering, flood risk.
Medical Doctor	Ranger/ Junior Ranger	1	1			Emergency service for visitors and PAMU staff, health services for Bedouin communities.
Veterinarian	Ranger/ Junior Ranger	1	1			Veterinary treatment for domestic stock, control of disease transmission to wildlife, eradication of feral animals, treatment of injured wildlife.
Community Liaison Officer	Ranger/ Junior Ranger	1	1			Liaison with local communities, community guards, promotion of participatory management, facilitating and monitoring of community projects.
Education Expert	Ranger/ Junior Ranger	2	1	1		Responsible for developing and implementing a PAMU public awareness/environmental education strategy, visitor surveys, production of materials, and maintenance of Visitor Center exhibits.

Job Title	Position	Target Number	Distribution over Management Sectors			Brief Job Description
			North	South	Inland	
Lab Technician	Junior Ranger	1	1			Technical field and laboratory support.
Ticket Collectors	Junior Ranger	3	1	1	1	Collection of entrance fees, distribution and sale of materials and guarding of PAMU property.
Community Guard	Community Guard	15				Reporting on general conservation and monitoring activities (wildlife, tourism, quarries, etc.), guiding and assisting Rangers on patrol, trail maintenance, cleaning, restoring areas, promoting conservation in local communities.
Equipment Operator	Technician	1	1			Operation and maintenance of PAMU heavy equipment.
Boat Operator	Technician	3	2	1		Operation and maintenance of PAMU boats.
Mechanic	Technician	2	1	1		Maintenance of PAMU vehicles and boats.

Appendix 18: Indicative List of Basic Equipment for PAMU Staff

Item	Target/Description
Transport	
4 × 4 vehicles	6
Patrol boats	4
Heavy machinery	
Soil moving equipment	1
Communications	
Radio network	Complete network
Satellite phones	3
Mobile phones	Made available until radio network established
Data Management	
Computers, software, statistical packages	6 work stations, 2 laptops
Patrolling Equipment	
Binoculars	10
Scopes	3
Cameras, lenses	2 regular, 2 digital, 2 underwater
Camping equipment	4 complete sets
Diving equipment	10 complete sets
Navigation Equipment	
GPS, compasses	5
Maps	3 complete 1–50,000 sets
Altimeter	3
Monitoring Equipment	
Traps, camera traps, rope, measuring tapes,	To be determined
First aid kits	3 complete kits
Lab equipment	1 complete kit

Appendix 19: Zone Descriptions (Arabic Translation)

نطاقات الإدارة الداخلية لمحمية وادي الجمال

من أهم الآليات التي يمكن أن تحقق أهداف محمية وادي الجمال الطبيعية هي إعداد خطة لتحديد نطاقات الإدارة بها. وتعتمد الخطة على الموارد المتاحة وعلى تصنيف كل نطاق وعلى مستوى الحماية الذي يحتاجه وإلى مستوى أو كثافة الإدارة وعلى القدرة على الاستمرار الاستخدامات التقليدية أو العامة أو التجارية الحالية. وتتضمن الخطة خطوطاً إرشادية وخطوات تطبيقية تسعى لتفادي الصراع الذي عادة ما ينشأ عندما تبذل محاولات للحفاظ على بعض المواقع وفي نفس الوقت تقنين استخدامها. كما تحدد الخطة أيضاً بعض الأماكن لأنشطة معينة مثل البحث العلمي والترفيه والسياحة والصيد. فعلى سبيل المثال مناطق الترفيه في المحميات المصنفة (٢) حسب تصنيف الاتحاد الدولي لصون الطبيعة IUCN مخصصة فقط للأنشطة الترفيهية مثل السباحة والغوص السطحي.

جدول (١) نطاقات الإدارة الداخلية

اسم النطاق	مدخلات الإدارة	الأثر المسموح
١- نطاق طبيعي صرف	منخفض – متوسط	لا أثر
٢- نطاق طبيعي ممتاز	مرتفع	منخفض
٣- نطاق لا يسمح بالصيد البحري فية		
٤- نطاق ترفيهي	مرتفع	متوسط
٥- نطاق حماية الحفريات والآثار		
٦- نطاق استخدام تقليدي		
٧- نطاق متعدد الاستخدام	متوسط	مرتفع نسبياً
٨- نطاق تنمية السياحة البيئية	متوسط	مرتفع نسبياً
٩- نطاق منطقة مجاورة (منطقة عازلة)	متوسط	مرتفع نسبياً

ويضمن البرنامج تقسيم محمية وادي الجمال إلى تسع نطاقات (الجدول ١) مقسمة بدورها إلى أربع مستويات للصيانة تتراوح بين المناطق الطبيعية الصرفة والتي لا يسمح فيها بأي نشاط إلى المناطق المتعددة الاستخدامات التي يمكن أن تمارس فيها العديد من الأنشطة ذات الأثر المحدود على الطبيعية على أن يتم ذلك في إطار محددات إدارية صارمة. أما النطاقات المصنفة مناطق خارجية فهي تلك المتاخمة للمحمية وتعتبر منطقة عازلة. ويبين (الجدولان ١، ٢) أهم الأنشطة المعتادة والمتوقعة في محمية وادي الجمال الطبيعية وحدد لكل منطقة ما يسمح به من أنشطة سواء كانت بحرية أو برية. وتبين الخريطة خطة التقسيم المقترحة لمحمية وادي الجمال.

هذا وقد أعدت هيئة التنمية السياحية (TDA) خطة لإدارة استخدام الأراضي (LUMP) للمنطقة الجنوبية للبحر الأحمر (الواقعة تقريباً بين مرسى علم ورأس بناس) يبلغ عمقها داخل الأراضي الساحلية خمس كيلو مترات. وتتداخل هذه الخطة إلى حد ما مع موقع محمية وادي الجمال. وقد بذلت هيئة التنمية السياحية وجهاز شؤون البيئة جهوداً كبيرة لتوفير ومواءمة خطة إدارة استخدام الأراضي مع خطة إدارة المحمية. تحدد خطة إدارة استخدام الأراضي للمنطقة الساحلية النظم الإيكولوجية الحساسة وتقرح تعليمات ولوائح خاصة بتنمية هذه المنطقة كمنطقة سياحة بيئية في المستقبل. وهكذا فإن تقسيم المنطقة الساحلية إلى نطاقات إدارية في محمية وادي الجمال يتفق تماماً مع خطة إدارة استخدام الأراضي.

وصف النطاقات :

١- نطاق طبيعي صرف

الوصف العام

تركزت النطاقات الطبيعية الأصلية جانباً حتى تتمكن من تفاعل كل العناصر الإيكولوجية التي تستحق الحماية ومن ثم فلا توجد بها طرق أو أي وسائل حديثة. وتتباين مساحات تلك النطاقات. فالمناطق المحددة لحماية الحيوانات البرية الصحراوية عادة ما تكون كبيرة نسبياً كما أنها نائية حتى يمكن أن تسمح بالتفاعل الإيكولوجي. أما بالنسبة للحيوانات البحرية والساحلية فقد تكون صغيرة مثل الجزر الصغيرة وإذا كانت الظروف مواتية فيوجد ممرات للحياة البرية تربط بين هذه الموائل الحيوية وتصنف من نفس فئتها.

مستوى الحماية: عال – وأثرها على البيئة صفر إذا أمكن.

الأهداف :

ضمان تمثيل واستمرار وجود كل العناصر النباتية والحيوانات الأصلية للمنطقة في حالتها الطبيعية داخل المحمية بحيث تستطيع الحيوانات البرية أن تنتقل بحرية بين الموائل الحرجة على أن يكون بها مواقع للرصد.

استراتيجية الإدارة العامة :

لن تكون هناك أي إدارة نشطة باستثناء الدوريات ووقف الأنشطة الضارة وأستئصال الأنواع الغازية (إن وجدت) الخ . وسيسمح فقط بإجراء البحوث العلمية الجادة. سيتم إغلاق أي مدقات سابقة ولن يسمح للجمهور بارتدادها وستستخدم فقط لأغراض الإدارة.

التمتية : لن يسمح بأي نوع من البناء أو التعمير للمنطقة وستكون كل المرافق العلمية قابله للنقل وسيسمح فقط ببعض اللوحات واللافتات الإرشادية في بعض المناطق الساحلية مثل مستنقعات وادي الجمال وشرم اللولي وبالقرب من مرسى أم العيسى وخليج القلعان وبالقرب من المناجروف في منطقة حماطة .

الاستخدام العام : سيقصر الدخول علي من يحملون تصريحاً بذلك وعادة ما سيكون هؤلاء من الباحثين العمليين ، وإن كان سيسمح في بعض المناطق المحددة بالزيارات الإرشادية والتعليمية (كما ذكر أعلاه) على أن يتم ذلك بإشراف المسؤولين وسيتم تحديد طاقة استقبال الزوار وإدارة الزيارات حسب خطط إدارة الموقع.

٢- نطاق طبيعي متميز:**الوصف العام :**

مناطق طبيعية ذات قيمة عالية جدا وقد خصصت أساساً لاستخدام عدد محدد من الزوار الذين سيستمتعون بتجربة فريدة في مناطق نائية

وهذه المناطق ممتدة الأطراف ومساحتها واسعة وعادة ما تكون مكونة من عدة وحدات ذات مناظر طبيعية مختلفه وخالية من أي منشآت من صنع الإنسان وسيقتصر استخدامها على تلك الاستخدامات التي لا تتطلب طرق للوصول إليها وسيتم تحديد مواقع الممرات لمرور الزوار في المناطق من هذه الفئة.

مستوى الحماية : حماية مرتفعة مع أقل تأثير ممكن على البيئة.

الأهداف : الحفاظ على بيئه الأحرش في حاله أشبه ما تكون بحالتها الطبيعيه بحيث تسمح بسياحة بيئية ذات قيمة كبيرة وكثافه منخفضة (باعداد قليلة) بحيث تعود بالفائدة على المجتمعات المحلية.

استراتيجية الإدارة العامة :

تحديد عدد الزوار (من الناحية العددية المطلقة ومن ناحية حجم المجموعة السياحية وعدد هذه المجموعات لكل منطقة) لضمان الحفاظ على بيئه هذه الأحرش المتميزة كمكان قريب للترفيه مع ادارة بيئية محدودة . وستقرض رسوم لدخول مناطق الاحراش المتميزة هذه .

التمتية : سيسمح فقط بخدمات الزوار (لوحات وعلامات إرشادية ودورات مياه ودروب ومماشي للسير بالأقدام)، ولا بد بقدر الإمكان من وقف التوسع في المستوطنات المحلية.

الاستخدام العام :

سيسمح بدخول الزوار الذين سددوا رسوم الحصول على تصريح وستتم السيطرة على عدد الزوار بشكل عام وعلى حجم المجموعات السياحية وعدد هذه المجموعات وستحدد وحدة إدارة المحمية عدد الزوار الذين سيسمح لهم بالدخول لكل موقع حسب حالته وظروفه. وسيسمح للمجتمعات المحلية بممارسه حياتها التقليدية طالما لاتهدد استدامة الموارد الطبيعيه في المنطقة أما الاستخدامات غير التقليدية مثل السياحة فسوف يتم تحديد عدد الزوار بما لا يخل بالناحية الجمالية والطاقة الاستيعابية للمواقع كما حددت ولكنها في جميع الحالات ستكون محدودة (طبقا لخطط ادارة كل موقع) .

٣- نطاق لا يسمح بالصيد البحري فية**الوصف العام :**

هي منطقة يمنع فيها تماماً حصاد الموارد البحرية وإن كان سيسمح فيها بأنشطة السياحة البيئية، كما سيسمح بإجراء البحوث العلمية.

مستوى الحماية : مستوى حمايه عال واثر منخفض على البيئة.

الأهداف :

تهدف هذه المناطق إلى حماية الموائل البحرية شديدة التأثير بوسائل الصيد الهدامة وإتاحة ملجأ للأنواع التي يتم جمعها بشكل جائر (سواء الأنواع المستهدفة أو التي يتم جمعها كمنتج جانبي غير مقصود) وزيادة إنتاج الأنواع المستهدفة خارج حدود المنطقه بحيث تكون هذه المناطق الخارجية مناطق تجريبية إرشادية لإثبات أثر الممارسات البشرية على البيئة الشاطئية وسيتم في هذه المنطقه توفير مواقع و فرص للسياحة البيئية الممتازة .

استراتيجية الإدارة العامة :

سيكون هناك دوريات مراقبه منتظمة لضمان وقف كل أنشطة الصيد . ولن يسمح بدخول هذه المناطق إلا لعدد محدود من الزوار لضمان حماية هذه المناطق المتميزة ذات القيمة العالية بأقل قدر ممكن من مخلات الإدارة ولا بد أن تكون هناك رسوم دخول واستخدام لهذه المنطقة، ولن يسمح بإجراء أي بحوث علمية إلا الجادة منها وغير المتابعة.

التنمية : لن يسمح بأي تنمية (مباني أو طرق) في هذه المنطقة.

الاستخدام العام :

يسمح بالدخول للزوار الذى سدوا رسوما للحصول على ترخيص ويكون الدخول محدوداً ويسمح به فقط لأغراض الغوص والغوص السطحي لزواري السياحة البيئية من أعلى مستوى الذين يقدرون قيمة الحفاظ على هذه المناطق الخاصة وإبقائها على حالتها الأصلية ويستمتعون بذلك ويقدرونه.

٤ - النطاق الترفيهي:

الوصف العام :

هي بشكل عام مناطق طبيعيه يسمح فيها بدخول الجمهور ولكنها منظمه بحيث يسمح للزوار بالاستمتاع بتجربة زيارة هذه المواقع داخل المحمية وهي عادة اماكن تتمتع بمناظر طبيعية خلابة ولها قيمة ثقافية كبيرة وإن كانت قيمتها بالنسبة للحفاظ على التنوع البيولوجي معتدلة.

مستوى الحماية : معتدل مع أقل قدر من التأثير على البيئة.

الأهداف:

توفير فرص للسياحة من الأماكن القريبة منها وإتاحة الفرصة للزوار للتمتع بالطبيعة وفي نفس الوقت توفير دخل للمجتمع المحلي.

استراتيجية الإدارة العامة :

ستكون الإدارة نشطة للحفاظ على الأماكن الطبيعية والتقليل قدر الإمكان من أثر الإضرار بالبيئة وذلك بإقامة المرافق وإيجاد مرشدين للمراقبة والرصد تنفيذ قواعد الجواله الخ وستكون الطاقة الاستيعابية لهذه المناطق أعلى بشكل عنها في المناطق الطبيعية المتميزة ومع ذلك ستكون هناك حدود معينه لضمان الحفاظ على هذه المناطق وطبيعتها بما يرضى الزوار.

التنمية:

سيسمح بتوفير خدمات للزوار (لوحات وعلامات إرشادية وتوجيهية ودورات مياه ومماشي للسير و دروب ومواقع مخيمات وعدد محدد من نزل السياحة البيئية، وسيسمح فقط بإقامة اثنين من هذه النزل وقد تم التنسيق مع هيئة التنمية السياحية لاختيار موقعين من قرية القلعان ومن شرم اللولى (إلا أن هذه المواقع لا تزال تحتاج إلى موافقة رسميه مبدئية من جهاز شؤون البيئة ثم يتبعها تطبيق الإجراءات المعتادة لتقييم الأثر البيئي) وستطبق على هذه المناطق معايير التنمية السياحية البيئية التالية (والتي أقرتها هيئة التنمية السياحية وخطة إدارة استخدام الأراضي) وهي:

- ألا تزيد مساحة المنشآت السياحية عن ٢% من إجمالي مساحة الموقع أو غرفة واحدة لكل فدان أيهما أقل.
- أن يكون الحد الأقصى للارتفاع دورين بحيث لا يزيد ارتفاعهما سوياً عن ٧ أمتار من القاعدة الى أعلى نقطه في المنشأة.
- أن تؤجر أو يعطى حق امتياز باستخدام كل قطع الأراضي المتاحة للتنمية في هذه المنطقة داخل المحمية ولكنها لن تباع.
- أن يسمح بالتنمية فقط غرب الطريق السريع الساحلي مع الابتعاد بمسافه ٢٠٠ متر على الأقل من أعلى مستوى من علامة ارتفاع المياه .

وبالإضافة إلى ذلك ستحدد وحدة إدارة المحمية خمس مواقع مخيمات داخل المنطقة الترفيهية في الجزء الداخلي من محمية وادي الجمال وسيسمح بالنمو الطبيعي للمستوطنات المحلية الموجودة فعلاً ذات الطراز المعماري المحلي طالما كان هذا النمو غير مبالغ فيه .

الاستخدام العام:

سيسمح للزوار بالدخول إلى الأماكن الداخلية بعد سداد رسم الدخول. وسيُنظم الدخول حسب الطاقة الاستيعابية للمنطقة وحسب خطط الإدارة المحددة لكل موقع وبشكل عام سيسمح بالدخول للمستخدمين المحليين لهذه المناطق .

٥ - نطاق الحفاظ على الآثار والحفريات :

الوصف العام:

هي المناطق التي تحتوي على موقع أو تجمع للمواقع الأثرية أو الدينية أو الثقافية الهامة وعادة ما تكون ذات مساحه صغيرة وتحتوي على مواقع حفريات او مواقع أثرية أو دينية أو ثقافية هامة تتطلب مستوى مختلف من الحماية والإدارة .

مستوى الحماية:

مستوى عال من الحماية مع أقل أثر ممكن على البيئة وستتم حماية بعض المواقع الصغيرة بإقامة حواجز حولها لمنع أي سيارات من الدخول وسيتم وضع لافتات في كل واحد من هذه المواقع يبين قيود الدخول والاستخدام.

الهدف:

حماية المواقع الأثرية ومواقع الحفريات داخل المحمية. وسيسمح بدخول الزوار إلي بعض هذه الأماكن بشرط الالتزام بالقواعد وأن يصحبهم أحد المرشدين المتخصصين أو حراس البيئة العاملين بالمحمية.

استراتيجية الإدارة العامة:

ستعتمد إستراتيجية الإدارة علي طبيعة كل موقع وعلی الجهة المشاركة فيه إلا أنه يتعلّق بالمواقع التي سيسمح بدخول الجمهور فيها فإن المبدأ العام سيكون التأكد من وجود حماية كافية ومرافق وإمكانيات ذات صلة لتطبيق هذه الإستراتيجية وذلك لتقليل أثر الزوار علي البيئة. وستتم حماية المواقع الأثرية الهامة وإدارتها بالتعاون مع المجلس الأعلى للآثار.

التنمية:

لن تكون هناك أي تنمية باستثناء وضع إجراءات الحماية المناسبة موضع التنفيذ وإعداد المرافق ذات الصلة علي أن تكون كلها قابلة للإزالة.

الإستخدام العام:

لن يسمح بدخول هذه المناطق إلا للزوار الذين سددوا رسوم الحصول علي تصريح. وسيكون الدخول للأماكن المختلفة حسب حساسية تأثرها بضغط الزوار وسيتم إغلاق بعض الأماكن بصورة موسمية أو بصورة دائمة بمنع دخول الزوار لها. في حين سيسمح للزوار بالدخول إلي بعض الأماكن الأخرى ولكن مع وجود بعض القيود علي ذلك (إرجع إلي المرفق ١٦ من هذه الوثيقة للإطلاع علي المعلومات الخاصة بنطاق السماح للزوار بدخول هذه المواقع الأثرية - وقد إقترح هذه المواقع خبير في الآثار والحفريات)

٦- نطاق استخدام تقليدي :**الوصف العام :**

هي مناطق كبيرة نسبياً ويسمح فيها فقط بالأنشطة التقليدية (مثل الرعي وصيد الأسماك الحرفي) التي تستخدم التنوع البيولوجي بشروط أن يكون هذا الإستخدام مقنناً. وهذه المناطق ستخصص أساساً لاستمرار نظم الحياة للسكان الأصليين والسماح لهم باستخدام مواد التنوع البيولوجي بشكل مستدام للحفاظ عليها. وستشتمل هذه النطاقات علي مناطق حاجزة وحامية للمناطق ذات الأهمية بالنسبة للصيانة الطبيعية.

مستوى الحماية : مستوي متوسط وأثر معتدل علي البيئة .

الهدف : تعزيز وضمان إستمرارية نظم الحياة والممارسات التقليدية للسكان المحليين.

استراتيجية الإدارة العامة :

إدارة نشطة مع بعض القيود علي التنمية وتطبيق إجراءات صيانة الموارد بما يسمح بالحفاظ علي مناطق الرعي وعلی إعادة موارد المياه الجوفية وإجراء المسح الخاص بالحيوانات والقضاء علي الحيوانات الغازية.

التنمية:

محدودة وسيسمح بإنشاء مدقات جديدة فقط للوصول إلي مناطق المستوطنات أو المناطق التي تستخدم استخداماً تقليدياً. ويسمح بالتوسع المعتدل في المستوطنات الموجودة فعلاً ذات الطراز المعماري المحلي. ويسمح للزوار بدخول المنطقة وسيتم وضع لافتات وعلامات إرشادية وإقامة دورات المياه ومماشي ودروب ومدقات ومواقع للمخيمات ، أما المرافق الثابتة فسوف تقتصر علي المخيمات التي يديرها البدو.

الإستخدام العام: سيسمح بالدخول للزوار الذين سددوا رسوم الدخول، وبشكل عام سيسمح للمستخدمين المحليين بالدخول.

٧- نطاق الاستخدام متعدد الأغراض:

ستتضمن تلك المناطق (فيما يتعلّق بالبيئة البحرية) معظم مسطحات المياه المفتوحة والمناطق الساحلية وشبه الساحلية أما فيما يتعلّق بالبيئة الأرضية فستضم هذه المناطق مساحات صغيرة ذات قيمة منخفضة بالنسبة للحماية البيئية وهي جميعها تشكل جزءاً صغيراً جداً من المحمية . وهذه المناطق قد تمت ترميمها فعلاً (مناطق حضرية) أو مناطق متاخمة تماماً لمناطق حضرية (مثل قرية الشيخ شاذلي) أو أنها كانت مستخدمة في التعدين وتدهورت هذه المناجم قبل إعلان منطقة وادي الجمال الطبيعية كمحمية.

مستوى الحماية : معتدل والأثر البيئي مرتفع نسبياً.

الأهداف:

فيما يتعلّق بالبيئة البحرية فإن هذه المنطقة ستستقبل أنشطة سياحية بحرية مكثفة نسبياً بالإضافة إلي الرياضات البحرية والصيد التجاري. أما في البيئة الأرضية فإن بالمنطقة أجزاء تمت التضحية بها في إستخدامات متعددة كتكريس التنمية الحضرية وبعض الأنشطة التجارية مثل التعدين في مساحات صغيرة لها قيمة بيئية منخفضة.

استراتيجية الإدارة العامة :

تتم مراقبة ورصد الأنشطة عن كثب لضمان التزامها بالقواعد واللوائح.

التنمية:

سيُسمح فقط بالاستخدامات الموجودة وذلك طبقاً لأحكام قانون البيئة رقم ٤ لسنة ١٩٩٤. وعلى أي نشاط جديد ان يتبع الإجراءات التي تنص عليها دراسات تقييم الأثر البيئي. ومن المفروض ألا يسمح بالأنشطة ذات الأثر الهدام بشكل كبير مثل قطع أحجار الجرانيت من المحاجر كما سيتم تدريجياً وعلى مراحل إلغاء هذه المحاجر في المستقبل القريب.

الاستخدام العام: سيُسمح للزوار الذين سددوا الرسوم بالدخول إلى هذه الأماكن البرية أو البحرية وهي بشكل عام مفتوحة للمستخدمين المحليين.

٨- نطاق تنمية السياحة البيئية:**الوصف العام:**

هي المناطق التي حددها قرار رئيس الوزراء رقم ١٣٤ لسنة ٢٠٠٣ بوصفها " مناطق تنمية سياحة بيئية " وهي أراض ساحلية في رأس حنكوراب وشمال وجنوب مدينة أبو غصون .

مستوى الحماية: منخفض – أثر بيئي معتدل

الأهداف: تحديد أماكن لإقامة منشآت للسياحة البيئية على أعلى مستوى طبقاً للمستويات العالمية للسياحة البيئية لتوفير خدمات سياحية فريدة وعلى أعلى مستوى لزوار المنطقة الطبيعية.

إستراتيجية الإدارة العامة:

رصد ومراقبة الأنشطة عن كثب لضمان الالتزام بقواعد ولوائح التنمية المتفق عليها. وسيُطلب ذلك إجراء تقييم أثر بيئي إستراتيجي لمنطقتي السياحة البيئية لتقييم الطاقة الإستيعابية الكلية للمنطقة التي ستتم تنميتها وتطويرها في داخل المحمية.

التنمية:

ستخضع التنمية لقيود تنمية حازمة طبقاً لمستويات السياحة البيئية التي تبنتها خطة إدارة استخدام الأراضي لهيئة التنمية السياحية وذلك بعد الانتهاء من مرحلة تقييم الأثر البيئي الإستراتيجي. وقد وضعت خطة إدارة استخدام الأراضي لهيئة التنمية السياحية الاشتراطات التالية للمنشآت في هذه المنطقة:

- ألا تزيد مساحة المنشأة السياحية عن ٤ % من إجمالي مساحة قطعة الأرض وبعده أقصى غرفتين للفدان أيهما أصغر. على ألا تزيد مساحة المنشأة بما في ذلك كل المرافق الترفيهية والمماشى والدروب والمنشآت البنية التحتية عن ١٠% من إجمالي المساحة المخصصة للمنشأة.
- أن يكون الحد الأقصى للارتفاع دورين بحيث لا يزيد ارتفاعهما عن سبعة أمتار.
- ألا يقل حجم قطعة الأرض المخصصة للمنشأة عن ٢٥٠,٠٠٠ متر.
- أن تبعد المنشأة مسافة ٢٠٠ متر على الأقل من أعلى مستوى من خط أقصى ارتفاع للمد وإن كان من الممكن زيادة هذه المسافة حسب درجة تأثر بيئة كل منطقة.
- الحفاظ على الغطاء النباتي وهذا يتضمن كل النباتات الساحلية في مساحة ٢٠٠ متر من ط المد. كما يشترط الحفاظ على الأنواع النادرة والمهددة وكذلك على النباتات الخاصة بهذه المناطق والتي لا تشكل جزءاً من منطقة المنشآت.
- لا يجوز تغيير المعالم الطبوغرافية التي يزيد ارتفاعها عن خمسة أمتار.
- لا بد من التقليل بقدر الإمكان من الأنشطة التي تؤثر على تآكل الأرض ونشر الغبار.
- لا بد من الحفاظ على كل مجاري الصرف الطبيعية (الوديان).
- لا يجوز أن تغير المباني أو الطرق من التضاريس الطبيعية بأكثر من متر واحد.
- لا بد من أن يتعادل قطع الأرض مع ملئها.
- لن يسمح باستخدام نباتات لإعداد الحدائق حول المنشآت بخلاف تلك النباتات من الأنواع المحلية.
- لا بد أن يوفر المخطط العام محاور وممرات تؤدي إلى الشاطئ بحيث لا يقل عرض هذه الممرات عن ٢٥ متراً وأن تكون المسافة بين كل ممر وآخر ١٠٠ متر وذلك لتيسير وصول الجمهور إلى الشاطئ.
- لن يسمح بإنشاء نزل للإقامة على الشريط الساحلي القريب من مناطق الشعاب السطحية الضحلة الغير الملائمة للسياحة والتي لا يوجد بها أماكن للوصول للمياه العميقة والتي تكون معرضة للأمواج الشديدة.
- تتم المحافظة على منطقة الشاطئ دون أي منشآت أو أي معوقات تخل بالملاح الطبيعية أو بالموائل أو بالنباتات. سيُسمح فقط بالأنشطة الشاطئية والصيد التقليدي.
- ستظل كل الطرق غير ممهدة كدروب طبيعية باستثناء الطريق الأساسي. وستقتصر حركة المرور على الطرق والممرات المحددة لذلك. أن دراسات تقييم الأثر البيئي للتنمية داخل هذه المنطقة لن يوافق عليها إذا لم تلتزم بكل الشروط الواردة أعلاه.

الاستخدام العام: سيُصرح للجمهور والزوار والمستخدمين التقليديين بالدخول.

٩- المناطق المجاورة (المناطق العازلة):**الوصف العام:**

هذه المناطق هي أشرطة ذات عرض متباينة تحيط بالحدود المقررة لمحمية وادي الجمال الطبيعية كما حددت في المادة ٣ من القانون رقم ١٠٢ (الجزء الثاني)

مستوى الحماية: منخفض إلى متوسط . مع أثر متوسط إلى مرتفع علي البيئة.

الأهداف:

المساعدة في تقليل التهديدات الخارجية علي المحمية من الإستخدام غير المستدام أو المتوافق للأراضي علي إستخدام هذه الأراضي المجاورة. وفي هذا المجال فإن " المنطقة المجاورة " ستعني " المنطقة العازلة "

إستراتيجية الإدارة العامة :

سيمنع منعاً باتاً القيام بأي أنشطة أو تجارب في المناطق المجاورة قد يكون لها تأثير علي بيئة أو طبيعة المحمية إلا بتصريح من الجهة الإدارية المعنية. وسيكون هناك نوع من الرقابة الإدارية داخل هذه المناطق المجاورة.

التنمية:

سيسمح في هذه المناطق بالسياحة التي تحددها قواعد خطة إدارة استخدام الأراضي (في أراضي هيئة التنمية السياحية والمحمية).

الاستخدام العام:

سيكون الدخول مسموح للزوار

الجدول (٢) الاستخدامات المسموح بها في كل نطاق للمكون الأرضي لمحمية وادي الجمال الطبيعية

منطقة عازلة	نطاق تنمية السياحة البيئية	نطاق متعدد الاستخدام	نطاق استخدام تقليدي	نطاق حماية الآثار والحفريات	نطاق ترفيهي	نطاق طبيعي ممتاز	نطاق طبيعي صرف	نطاق النشاط
نعم	نعم	نعم	نعم	نعم	نعم	نعم	بتصريح	الاستخدامات الترفيهية السياحة البيئية مراقبة الحيوانات البرية.....الخ
نعم	نعم	لا	لا	لا	نعم	لا	لا	فنادق وأماكن إقامة بيئية
نعم	نعم	لا	لا	لا	نعم	نعم	لا	مواقع بيئية
نعم	لا	نعم	نعم	لا	نعم	نعم	لا	مواقع مخيمات
لا	لا	لا	لا	لا	لا	لا	لا	عربات بائع عجلات
نعم	نعم	نعم	نعم	نعم	نعم	نعم	لا	تراث ثقافي
								استخدامات تجارية
بترخيص	لا	بترخيص	لا	لا	لا	لا	لا	المناجم
لا	لا	لا	لا	لا	لا	لا	لا	المحاجر
بترخيص	لا	لا	لا	لا	لا	لا	لا	التنقيب عن المعادن
بترخيص	لا	بترخيص	بترخيص	لا	لا	لا	لا	تصنيع الفحم
نعم	نعم	نعم	نعم	لا	لا	لا	لا	النقل
نعم	نعم	نعم	نعم	لا	لا	لا	لا	الاستخدامات التقليدية جمع النباتات الطبية
نعم	نعم	نعم	نعم	نعم	نعم	نعم	لا	الرعي
نعم	نعم	نعم	نعم	لا	لا	لا	لا	جمع الحطب
نعم	نعم	نعم	نعم	نعم	نعم	نعم	NA	زيارة المواقع الدينية
بتصريح	بتصريح	بتصريح	بتصريح	بتصريح	بتصريح	بتصريح	بتصريح	استخدامات اخرى البحث العلمي

الجدول (٣) الاستخدامات المسموح بها في كل منطقة

من المكون البحري لمنطقة وادي الجمال الطبيعية

نطاق استخدام متعدد	نطاق ترفيهي	نطاق استخدام تقليدي	نطاق لا يسمح بالصيد البحري فية	نطاق طبيعي صرف	نطاق النشاط
نعم	نعم	نعم	لا	لا	<u>الصيد كوسيلة لكسب العيش</u>
نعم	لا	لا	لا	لا	<u>الصيد كوسيلة للترفيه</u>
نعم	لا	لا	لا	لا	الصيد بالسنارة اليدوية او بالسنارة الآلية من الشاطئ
نعم	لا	لا	لا	لا	الصيد بالسنارة اليدوية او السنارة الآلية بالقرب
نعم	لا	لا	لا	لا	الصيد بالشباك من الشاطئ
نعم	لا	لا	لا	لا	الصيد بالشباك من القارب
نعم	لا	لا	لا	لا	الصيد بالفخاخ
نعم	لا	لا	لا	لا	جمع اللاقاريات
نعم	لا	لا	لا	لا	الصيد بالرمح
					<u>الصيد التجاري</u>
بترخيص	لا	لا	لا	لا	الصيد بالسنارة اليدوية أو الآلية
بترخيص	لا	لا	لا	لا	الصيد بالشباك من الشاطئ
بترخيص	لا	لا	لا	لا	الصيد بالشباك من القارب
بترخيص	لا	لا	لا	لا	الصيد بالفخاخ
لا	لا	لا	لا	لا	الصيد بالشبكة المخروطية
بتصريح	لا	لا	لا	لا	جمع الأسماك لبحاوض السمك
لا	لا	لا	لا	لا	الصيد بالرمح
بتصريح	لا	لا	لا	لا	<u>أغراض تجارية أخرى</u> تربية الأسماك
لا	لا	لا	لا	لا	التقيب عن المعادن واستخراجها
بتصريح	بتصريح	بتصريح	لا	لا	الصيد بقوارب مستأجرة بالكامل
بترخيص	بترخيص	بترخيص	بترخيص	لا	استعمال القوارب المستأجرة بالكامل لأغراض أخرى
نعم	نعم	نعم	نعم	لا	<u>أغراض ترفيهية أخرى</u> الإقلاع بالقوارب
نعم	نعم	نعم	لا	لا	الأنشطة الرياضية على سطح المياه
نعم	نعم	نعم	نعم	لا	(سكوبا) الغوص
نعم	نعم	نعم	نعم	لا	الغوص على السطح
نعم	نعم	نعم	نعم	لا	السير على الشعب
نعم	نعم	نعم	NA	لا	أنشطة شاطئية
بتصريح	بتصريح	بتصريح	بتصريح	لا	<u>أنشطة أخرى</u> استخدام السقالات والمراسي والشمندورات..... الخ