June – November 2002

Introduction
The State of Hawai‘i Department of Land and Natural Resources (DLNR) has a proud history of providing the public with opportunities to experience many unique recreation settings. The Division of State Parks manages 58 features with an annual budget of 6.5 million. The Division of Forestry and Wildlife manages 800,000 acres of Forest Reserves including 700 miles of roads and trails with a recreation budget of 2.5 million. The Hawai‘i Tourism Authority has an annual budget of 60 million which it uses to promote tourism.

Objective
The State of Hawai‘i DLNR and USDA Forest Service signed an interagency agreement in February of 2002 that created this partnership to assist with the development of a risk assessment for DLNR lands. The Risk Assessment Team (RAT) developed a standard protocol for assessing risk at trail and park features. Hazards are identified, mitigation measures recommended, and alternatives discussed with local DLNR managers. The goal is to create a template that can then be used to complete a study of all DLNR Class I and Class II lands.

Method
The RAT evaluated risk associated with recreation use in a range of settings. The inventory represented a cross-section of the available recreational experiences on the Islands. The sites inventoried were selected based on their inherent risks as identified by Divisions of State Parks and Forestry & Wildlife. These trails and recreation sites are identified on the maps provided in this report. The team used a rapid assessment approach in the field, visiting the sites on two week assignments between June and November, 2002. RAT traveled via helicopter to remote sites and hiked out to designated locations or visa versa. All trails were walked and risk associated with each was documented. An inventory sheet was used as a basis for evaluating recreation risks associated with trails, recreation sites and other important features. A Garmin, hand-held GPS unit was used to capture a UTM location and later transferred as a point theme in Geographic Information System (GIS). Points were attributed with identifying names and associated risk.
Digital photos were captured at all locations to document the degree of risk and current conditions. Some of these have been included in this report. Notes, evaluations, maps and observation were all included in the assessment process.

RAT had a debriefing meeting at the end of each day in the field to discuss risks associated with the sites visited that day and to collaboratively provide expertise on mitigation and recommendations seen in this report.

**Conclusions and Recommendations**

Preliminary findings suggest a need for a comprehensive capital investment program (CIP) that targets key attractions in Class I and II areas managed by the Department of Land and Natural Resources. The team recommends that the first CIP focus on consistent **signing**, **handrails**, safe **viewing areas** and hardened **trail surfaces** in high visitation locations. In addition, the team recommends that **vegetation and fuels management plans** be developed and implemented around high visitation locations to respond to large concentrations of hazard trees and fuels.

**1. Management**

**A. Enforcement, Rules and Regulations**

**Background**
- Rules and regulations for each division in the Department of Lands and Natural Resources are promulgated from Hawaiian State Law and are different for each division in both subtle and obvious ways.
- Because of this there is inconsistency between divisions at the basic rules and regulation level.
- This inconsistency is especially problematic for the law enforcement entity which also an independent division.
- As law enforcement personnel move from one jurisdictional area to the next in pursuit of violations, investigations etc. confusion arises especially near jurisdictional boarders. This often leads to an excuse to "do nothing".
- This inconsistency is also confusing to the public as well.

**Recommendations**
- Divisions should request that the appropriate entities (access board, legislature, others) work to form consistent rules and regulations for those Divisions sharing similar jurisdictions (ie, Lands, Parks and Forestry and Wildlife).
- Consider providing each Division with some law enforcement capability (level two) so that violation notices or citations can be issued by "on the ground" personnel of the appropriate jurisdiction.

**B. Trails Management**
Background
Trail conditions in Hawaii vary from excellent to very poor. In all cases, the trails considered excellent receive extensive reconstruction and maintenance while the poor trails are maintained only irregularly. Trails were normally formed as a result of historic use along the most direct route without regard to erosion or safety, so they ascend a ridge top very steeply or parallel a river through muddy soils. These traditional routes may have been practical for the limited use they received and the different standards of safety used at the time, but they shouldn’t necessarily be continued today.

Recommendations
Steep ascents on narrow ridges of decomposing basalt should be rerouted whenever possible to avoid the gully and trenching so common on many trails. Heavy, seasonal rains combined with the mechanical erosion of foot traffic are making trails into compacted, clay slides that are difficult to traverse even in dry conditions. The rerouted trail should follow the slope contours with gentler grades under 15% where possible, allowing water to drain across the trail and down the slope instead of along and down the trail corridor.

Muddy trails along the edges of rivers are usually slippery and often have extensive erosion of tree roots that become tripping hazards. These trails can often be moved onto more stable soils on a nearby ridge or slope, intersecting the river only occasionally for crossings and viewpoints. Choose trail locations carefully and consider the vegetation and soil conditions that can withstand foot traffic without extensive hardening of the tread surface. Proper drainage of surface water is the key to long-term stability. Surface water causes extensive erosion and must be removed from the trail with water bars and drains to prevent gullies from forming during high flow periods.

Along heavily used trails there is often no choice but to harden the trail surface with boardwalk, gravel or something more durable. Costs of reconstruction are high but proper design can save maintenance dollars in the long run and provide much safer conditions for novice hikers.

C. Standardized Trail Classification System

Background
Hawaii’s trails are varied in many ways. Some are suitable for inexperienced hikers with limited physical abilities while others require good physical ability, adequate preparation, and much more time. A classification system would help hikers wisely choose trails that correspond with their skill level and preparation.

Recommendations
A trail classification system should be:
- Easy to recognize and familiar to most hikers
- Based on objective trail conditions
- Readily accepted by managers and users alike
Three trail classes could be used as part of the difficulty rating system:

- EASIEST, indicated by a green circle
- MORE DIFFICULT, indicated by a blue square
- MOST DIFFICULT, indicated by a black diamond

These classes are used at alpine ski areas, on Nordic trails and on hiking trails in many areas and should be easily recognized by most hikers. The trails that fit within each class should be judged by the following criteria. Any combination of factors could raise or lower the condition class. They needn’t have all of them.

- GRADE  how steep is it overall, and how steep in its most difficult areas. Grades over 15% might be considered most difficult while those under 5% are easy
- TREAD CONDITION 4’ wide asphalt would be easiest, 24” wide boardwalk might be easiest or more difficult if it has steps, while the most difficult might have slippery clay on an 8” wide tread or large boulders to hop
- LENGTH can it be completed in under one hour, or does it take all day or more?
- HAZARDS are there cliffs, thick vegetation, historic rock fall, few or no warning signs, exposure of sun, wind or surf

Some examples of trails in each class might be:

- EASY = FERN GROTTO because it is short, paved and has signs & handrails
- MORE DIFFICULT= AWAAWAPUHI & CLIFF TRAILS because they are longer, have steep drops alongside the trail, have good tread in general but poor tread in places, climb back up the hill in occasionally steep grads exceeding 10% DIAMOND HEAD TRAIL is probably in the this class despite steep grades, stairs have been used to decrease the difficulty
- MOST DIFFICULT= KALALAU TRAIL because the grades often exceed 15% and the severe erosion, falling rocks, steep cliffs, exposure to sun & wind and 11 mile length require more experience and preparation. MAAKUA GULCH because of the slippery boulders the length of the canyon.

D. Signs

Background
There is a critical need for a statewide interagency (or interdivisional) standard signing policy. This policy should be used by State Parks, Forestry and Wildlife, Lands and other agencies or entities managing recreation facilities and trails. The lack of signing consistency between divisions was the single most evident problem.

Recommendations
1. After ten days of observation and assessments of Kaua’i and Oahu Divisions of State Parks and Forestry and Wildlife trails and related facilities the following is recommended:
   a. A new statewide policy should be developed from the model of the USDA—Forest Service national signing program that is outlined in the Signing Handbook of the Forest Service. Utilizing this model will allow
the State of Hawai‘i to design policy that is consistent with national and international standards and will provide at the very least the following:

1. **Consistent sign types** (Recreation, administrative, interpretive, hazard and safety, travel management, partnership/cooperator, traffic control, etc.)
2. **Consistent messages** by sign type, with guidelines on brevity, positive attitude, respect, information need, simplicity, etc.
3. **Consistent Designs** (including sizes, materials, quality, colors etc.)
4. **Consistent sources** (or competitive sources) of manufacturing (this should include ordering and procurement procedures and policies).
5. **Consistent methods of installation** (allowing for local conditions).
6. The use of national and international symbols, shapes, sizes, colors and sign types should be used whenever possible.
7. **Standard pictographic signs** for hazards and uses. (Special hazards for Hawaii will need special design features such as falling rocks, waterfalls, stream crossings, etc).

b. The policy should also direct managers to:
   1. Document maintenance schedules by trail or other logical division.
   2. Document inventory and monitoring of sign conditions and replacement needs.
   3. Document the frequency of maintenance, inventory and other treatments. These should be tied to management priorities based on trail use, budgets and costs and or by trail classification and should be documented.

2. **Other General Signing recommendations**
   a. **Trailheads**
      1. Trailheads should be where the basic information on the trail conditions, safety and user needs should be identified. Trailheads should invite information seeking and be easy to move through from an informational point of view. Both State Parks and Forestry and Wildlife trailheads are sterile in their feel and lack basic information.
      2. Consider a cultural “Hawaiian” theme in the design of trailhead informational layouts, kiosk or other designs.
   b. **Trail Classification Systems**
      1. A consistent statewide trail classification system is needed to facilitate the overall statewide signing policy that is recommended. See section on trail classification.
   c. **Hazard Identification**
      1. Pictographic designs for special hazards in Hawaii should be developed and used sparingly where needed.

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**E. Commercial Guides and Permit Administration**
Background
Commercial guides provide visitors with access to many of Hawaii’s parks and forests. Some restrictions are placed on where and when the guides can provide services. Permit administration varies greatly between divisions.

Recommendations
All commercial fees should be returned to the local land managers to create an incentive for improving permit administration. Operating plans should be developed for each guide. The operating plan is the annual document that directs the daily commercial operations of the business. The requirement of an operating plan helps assure that a high quality safe recreational experience is being offered to the public. It also aids in keeping open communications between the division and the guide, thus providing a stronger working relationship. Operating plans may include the following: business plan, safety plan, certification requirements, guide qualifications, procedures, equipment and maintenance. Formal evaluation of each commercial guide should be made on an annual basis. Meeting should be held prior to and at the end of each season to discuss rules, regulations and concerns.
Trail Specific Recommendations
The following is a detailed description of the sites visited on Kauai. Map 1 provides an overview of sites visited between June 10th and 16.

1. Na Pali Coast State Park  Kalalau Trail  (West Section)  Division of State Parks  6/10/02

Hazards
- Trail Surface
  o Confusing
  o Disappearing
  o Steep drops, cliff-fall potential
  o High wind
  o Slippery
  o Poorly designed trail mitigation
Photo 1 – Poorly Designed Trail Mitigation

Photo 2 – Slippery, Confusing Trail Conditions with Steep Drops
Kalalau Trail Hazards

1. Loose trail. Monthly maintenance required.
2. Signature rock. Vandalized area.
3. Thin wire railing with rotten and frayed. Needs reconstruction or total rebuild.
4. Deeply eroded trail.
5. Vandalized sign. Illegal firearm and camping.
7. Red Hill. Slick and deeply eroded trail.
8. Rock fall above campsites.
10. Dangerous roots exposed on trail.
11. Steep drop as a result of poor trail maintenance.
13. Rock fall hazard at falls.
14. Rock fall hazard at falls.

Map 2 – Kalalau Trail Hazards
• Rock fall
  o Wet and dry events cause rock fall along trail and above frequently used campsites
  o Goats cause rock fall at any time

Photo 3 – Steep Cliffs with Evidence of Frequent Rock Fall

Mitigation
• Increase maintenance
• Remove existing structures that are providing false sense of security and look unprofessional
• Signage
  o Minimize text
  o Increase pictorial
  o Sign water hazards at beach
    ▪ Document key access points
    ▪ Sign key access points
• Use interpretive message to include risks and hazards
• Focus on pre-trip message
Sign Recommendations

Kalalau Trail
 o Trailhead
  ▪ Signs are of mixed quality and standards at trailhead
  ▪ Kiosk should be brightened up and made more inviting—Too dark.
  ▪ Safety messaged should be emphasized at trailhead with information on hazards, equipment needs (water, sunscreen, water and proper shoes) and user skills.
  ▪ Note: Trail brochure is out of print and should be reprinted to include updated safety info.

 o Trail
  ▪ Mileage markers only in day use section a mile intervals. Too low creating tripping hazard.
  ▪ River crossing sign not necessary, remove.
  ▪ Hazards that are signed, signing not consistent, simplify and use pictographs if possible.
  ▪ Cliff at windy point may need to be signed. Pictograph only.

 o Destination (campsite and beach)
  ▪ Signs to designate campsites by number (see other recommendations on designated campsites.
  ▪ Reduce signage at camp and beach, too many signs.
  ▪ Pictographic hazard signs at falling rock areas only.

Kalalau Trail (Hanakapiai Falls)
a. Heliport
  1. Relocate trail and sign appropriately
  2. Relocate sign to access point on shelter side of heliport.
b. Trail
  1. Manage and maintain (currently not maintained) due to heavy use.
  2. Remove old stream crossing sign, consider not signing streams crossings.

  3. Destination (Falls)
     1. Create viewing area
     2. “End of trail” sign
     3. “Falling rock” pictograph sign at viewing area.

Kalalau Trail (beach to trailhead)
a. Trail
  1. Add interpretive sign at key overlook (high use good views)
  2. Limit mileage marker to 1 per mile
3. Change type of mileage marker, too low, tripping hazard.

b. Destination (beach)
1. Stream crossing hazard needed due to flow ??
2. Beach hazard signs with tsunami sign high on trail not needed. Move to beach area. Too many signs in this area.

2. Koke’e State Park Nature Trail Division of State Parks
   6/10/02

Hazards
- Improper design for intended use-group
  - Steep slope on last 50 feet of trail
  - Uneven surface

Mitigation
- Grade uneven surface
- Convey to public that the trail is not easy at its end
- Tie the trail into the mission of the museum
3. Na Pali Coast State Park  **Kalalau Trail** (East Section) Division of State Parks (Trailhead to Hanakapiai Beach to Waterfall) 6/11/02

**Hazards**
- Beach to Falls: need sign that state that the trail is unmaintained
- Stream crossings are difficult
- Slippery trail
- Unclear trail near waterfall
- Dangerous Heliport
- No “end of trail” sign

![Photo 5 – Signage Missing indicating difficulty of Trail Conditions](image)
Photo 6 – Difficult and Slippery River Crossings

Photo 7 – Dangerous Heliport Crossing
Mitigation

- Trail needs to be re-routed around heliport
- Erase secondary trails on way to waterfall
- Define stream crossing zones
- Define trail to falls after stream crossing
- Define risks at waterfall
- Build waterfall viewing site
- Separating Kalulau into east and west management is not cohesive. Management needs to be uniform for the entire trail

Sign Recommendations

- Focus on key messages
- Explain environmental hazards
- List necessary equipment
- Use simple messages

4. Lumaha’i Beach Access  Lands Division  
6/11/02

Hazards

- Signs are misleading
- Dangerous pullouts
Mitigation
- Block “No Access” zones instead of signs
- Parking, signing, and pedestrian walkways need to be re-thought
- Need a path from parking lot to trailhead

Signing
Trailhead
1. Signs in parking areas misleading about access, need to direct to proper access.
2. Reposition access sign at trailhead to lead to trail.
3. Work with highway dept on safe site plan given traffic problems.
5. **Uluwehi Falls**  Division of State Parks  
6/12/02

This short trail starts at a boat and kayak landing along the Wailua River and follows the river up to Uluwehi Falls. The trail is in generally good condition but could be vastly improved to accommodate the large number of inexperienced hikers using it. The largest problem is at the end where the trail shortcuts to an unsafe rock fall zone adjacent to Uluwehi Falls.

**Hazards**
- Steep, slippery and disorganized kayak landing
- Vague and slippery stream crossing
- Slippery getting on bank after stream crossing
- Rock fall at waterfall is extremely dangerous
- Shortcut at waterfall leads to hazardous location
Photo 12 – Dangerous Rock Fall and Slippery Trail Conditions

Photo 13 – Swimming beneath falls and near previous rock slide
Photo 14 – Disorganized and Hazardous Kayak Landing Conditions

Mitigation

- Erase shortcut to waterfall
- Create attractive viewing area or series of viewing areas outside of fall zone
- Cut off access to creek before the waterfall to keep people from entering fall zone

Trail Recommendations

- At the second kayak landing the steep bank could use a temporary ladder secured to the bank like a ladder on a dock. It could be simple and disposable if needed. An alternative would be to harden the bank with gabions filled with rock. The gabions could ascend the bank in a stair step arrangement.

- Another boat landing could be constructed below the steep bank area to allow better storage of kayaks. The trail could be extended down the dike further to link with this access point. This would perhaps allow elimination of the kayak landing zone on the floodplain island thereby also eliminating the need to cross the slippery river near the steep bank.

- The trail along the old dike is fairly level but slippery with many exposed roots to trip on. During the wet season the bottom of the dike is very slippery as water and mud accumulates. The trail should be moved to the top of the dike by constructing a turnpike atop the dike. This would better protect the cultural resource, the trees, and would keep people out of the muddy dike. Use of geotextile and geocell fabrics may assist the exposed tree roots in holding the gravel, coral, or other surfacing material. Another alternative is to construct a continuous boardwalk along the entire dike. This could be made ADA accessible but could cost $100,000 or more for the mile of trail needing treatment.
• The shortcut at the 3600’ point ascends the hillside through old taro terraces. This is an interesting and attractive walk, but it unfortunately leads to a location near the Uluwehi Falls that should be closed to people due to high rock fall hazard. The shortcut could easily be removed since an alternative route along Uluwehi creek exists. The primary advantage of this alternative route would be to bring users up the creek to the falls and to allow them to stop at a safe distance from the falls. It also prevents damage to the taro terraces themselves.

• The alternative trail up the Uluwehi creek could be improved with turnpike to accommodate the increased traffic it would sustain. Use of geotextile and geocell fabrics may be appropriate in some of these places.

• Viewing pads should be created at a safe distance from the falls amongst the large boulders near the creek. These pads could be created from loose rock piled in amongst the boulders to form flat pads upon which smaller rock or gravel is placed. Three or four of these pads, roughly 12’- 15’ in diameter, would make an attractive spot to sit and watch the falls, especially if some trees are cleared to open the views. This would invite viewers to remain back in the safe zone.

• Visitor monitoring is essential in this location. At the present little is known about how many visitors concentrate in this setting. Carrying capacity at the kayak landing are currently well beyond the limits of the resource. Impacts are strongly evident. Numbers of visitors entering from the Kayak landing and at the falls would aid in establishing some of capacity and set limits on use.

Sign Recommendations

a. Trailhead. Water access from Marina. Marina area needs location and directional signing.
   1. Kayak landing signing should be similar to trailhead info.
   2. Archeological resources are important and should be protected and interpreted if possible.

b. Trail. Heavily used and some hazards exist and should be identified if current location is maintained.

6. Fern Grotto  Division of State Parks  6/12/02

Hazards

• Kayak landing is too small and steep at Fern Grotto
• Tangled roots on trail
• Deep water
• Broken concrete, slippery trail, insufficient handrail, sloping trail, and major dips in trail to Fern Grotto
• Rock fall hazards around Fern Grotto. Tourists are attracted to fall zone.
• Slippery mud on trail to Fern Grotto
Photo 15 – Informal, Slippery Kayak Landing

Photo 16 – Dangerous, slippery trail and walkway conditions
Mitigation
- Kill slick algae on concrete trail
- Build kayak dock, ramp, and storage area
- Re-surface trail to Fern Grotto
- Build viewing area of Fern Grotto away from fall zone. Prohibit access to the actual grotto.

Sign Recommendations

a. Trailhead-At landing dock
   1. Dangerous for kayaks due to lack of docking room because of dominance of barge traffic. Build floating dock with gang plank.

b. Trail
   1. Sign slippery areas.

c. Destination
   1. Sign slippery areas.

Note: Guides and commercial operators should be given more responsibility for safety and signing as well as overall maintenance.

7. Keahua Arboretum Division of Forestry and Wildlife 6/12/02

Hazards
- Water hazards at popular river
  - Submerged objects
  - Rising water
  - Changing conditions
Children on road/river crossing

- Rope swing
- Children sliding into river
Mitigation
- Remove rope swing
- Prohibit bank slide with concrete and rocks
- Signage
  - Swimming hole hazards
  - Regulatory sign at entrance

Trail Recommendations

Monitoring activities are currently being performed to capture commercial use in the region. Other technologies such as counter pads would aid in differentiating between different types of uses and aid in substantiating commercial activities.

Sign Recommendations

a. Entrance
   1. Need better entrance info signage at both entrances.

b. Within Park
   Need only interpretive signs as dictated by plan for park.

8. Waelealae 4 x 4 Road  Division of Forestry and Wildlife  6/12/02

Hazards
- Irrigation canal is dangerous
- Metal cable at dam crossing at end of road
Mitigation
- Reflector at canal
- Remove cable
- Sign 4WD road

Sign Recommendations
a. “End of Road” may be needed at gate.
b. Reflecting signs are recommended at irrigation diversion and canals along road.

9. Alakai Swamp/Pihea Trail  Division of Forestry and Wildlife  6/13/02
This trail is expected to be one of the premier trails on Kauai once the boardwalk is completed. The existing boardwalk is of 2” x 12” redwood planks with wire mesh surfacing and is very well built. The swamp vegetation is unique and very beautiful and worthy of the investment in materials to protect it.

Hazards
- End of Alakai trail viewing platform is extremely slick. Traction screening is oriented improperly.
- Screening has tendency to come off boards and cause hiker to trip.
- Some boards are bouncing. Could surprise hiker and cause fall.
- Spans too long and the boards sag in some spots.
- Boards at different heights could cause slipping.
- Drainage problems
- Deep erosion

Photo 21 – Screening on Deck causing slippery conditions
Mitigation
- Manage trail to parking lot. Cooperate with State Park
- Install screening at viewing platform oblique to platform
- Document maintenance plan and stick to it
- Upgrade viewing platform with benches and railing when boardwalk is completed

Trail Recommendations
- The start of the trail near the Puu O Kila lookout is an old roadbed that’s badly eroded and terraced. This section receives the heaviest traffic as it is an easy walk from the parking area, yet it is the ugliest portion of the trail and is very slippery. If a central trail turnpike were established of about 4’ width, the areas alongside could perhaps be revegetated with some special grants for this kind of work? Although portions of this section are shared by each of the DNLR Divisions, the Division of Forests should likely resume control of the entire piece to insure consistent maintenance.

- The reroute near the Pihea lookout is scheduled for construction once the EA is completed. This should be a top priority since it is close to the start of the trail and is in especially poor shape.
• Some failures of the planks are to be expected where trees fall on them and crack boards, especially where the spans between supports exceed a few feet in length.

• Wire mesh surfacing will need cyclical replacement every few years to prevent peeling and resultant tripping hazards. Plastic mesh might be used as rot resistant alternative but it is unknown whether it would be an improvement, especially if it is difficult to procure.

• Some of the supporting 4” x 4” timbers were not anchored with metal piling material and are “bouncy” as a result.

• Occasionally the two planks forming the tread are at different heights which can trip some hikers. This may be caused by excessive span lengths between supports and could be cured by adding an additional 4” x 4” support timber.

• The muddy areas near the creek crossing that don’t yet have boardwalk are very slippery and should soon be scheduled for them.

• The platform overlook at the end would be better if it were expanded and if benches were built to invite relaxation. The wire mesh should be oriented diagonally (oblique) to the direction of the planks to increase traction.

Sign Recommendations

a. Trailhead
   1. Information and safety information needs to be provided as recommended in the general recommendations.
      1. Sign at lookout in disrepair, replace and improvement is recommended.

b. Trail
   1. Signing along trail in good condition
   2. Interpretation potential is high
A beautiful and popular trail said to be one of the top five priorities of the Division of Forestry and Wildlife on Kauai.
Photo 25 – Steep Drops Combined with Eroding Trail Conditions

Photo 26 – Tree limbs overhanging Trail
Map 3 – Awaawapuhi, Cliff and Nualolo Trail Hazards

Trails were assessed by the Risk Assessment Team between June 14 and June 16, 2002. The Risk Assessment team was accompanied by Hawaii Forestry and Wildlife representatives. Point locations are not exact and intended for graphical representation only.

15. Rock fall hazard at mile 2.8.
16. Steep escape drop before 1 mile mark. Real route is necessary.
17. Inadequate trailhead sign at bottom of signpost "false peak."
19. After 2 mile mark. Trail deep erosion. Needs to be re-routed to follow contours.
20. Steep drops and dusty conditions
22. Steeply eroded and collapsing trail surface. Dangerous trail potential.
23. Mile 1.75 has steep drop and eroded/dangerous trail. Needs re-contouring.
24. Dead log hanging over trail.
25. A spur trail at lookout point use of dangerous area outside of safety zone.
26. Landslide cones are active and need protection maintained.
27. Rock slide in trail below stream crossing.

Hazard Location

Designated Trail

Map 3 – Awaawapuhi, Cliff and Nualolo Trail Hazards
Tread is generally in good shape except for the ridge-top drops where grade exceeds about 10 to 15%. In these spots heavy erosion from channeling water has combined with extensive foot traffic and occasional horse traffic to form excessively deep troughs. Some of these are very slippery.

Originally the trail was used by cattlemen on horseback to tend wild cattle in the valley. The current alignment likely follows the original trail, but is not holding up well under increased traffic.

At the end of the trail for about the last mile, steep wind and water-eroded cliffs are eating away at the trail tread, to the point of danger. The primary example of this is along the cliff trail between the Awaawaphui junction and the picnic shelter where the trail traverses a large landslide.

Hazards
- First section is steep and slick (leaves and clay)
- Hazardous trees limbs on first mile
- Trailhead sign was not adequate and was at the bottom of the trail “totem pole”
- Redundant end of trail sign
- Steep drops combined with rapidly eroding trail
- Equestrian hiker conflicts on narrow trail with limited escape routes for hikers
- No water control

Mitigation
- Prohibit equestrian use
- Add interpretive panels at the end of trail
- Define end of trail with better experience
- Cut down loose and dangerous tree limbs
- Construct water bars and erosion control

Trail Recommendations
- This is top priority for a reroute.

- Other fixes along the trail are suggested below by their approximate mile marker location: ~ 200 yds prior to 1.0 mile from Nualolo trailhead there’s a steep, eroded drop that is slippery even on a dry day. A re-route of the trail would require a substantial change from current alignment, but is necessary for safety and erosion prevention.

- ~300 yds past 1.75 mile a log has fallen onto the trail and is causing an unnecessary rerouting of the alignment as people scramble around it. Remove the log and realign the tread. This same type of windfall problem has probably caused other unintended reroutes of the trail. Remove all windfalls promptly to prevent this.
• 2.0 mile the canopy changes and becomes much more open and arid. About 300 yds past this point there is a 4’ deep erosion trench along the trail corridor which requires a re-route. The eroded trail corridor must be totally obliterated and relocated to contour more gently down the adjacent slope. Following side-slope contours allows water to drain across and below the tread instead of channeling onto and along the tread. Look for all possibilities, at this point and others, to reroute the trail onto side slopes and follow contours of the slope (thereby reducing the trail grade).

• 2.5 mile area has a 6’ deep erosion trench with the same problem as above.

• Just prior to 2.75 mile is a spot where good trail alignment follows the slope contour and gently descends at under 10% grade (see Gary Oye photograph with a map on the trail). Use this as an example of proper alignment which allows water to move across (instead of down) the trail.

• ~200’ prior to junction of Anaki hunters route is an eroding sideslope where the trail will likely fail as it is undercut from below. Move alignment further onto the ridge and prevent travel along eroding edge.

• 150’ prior to Awaawaphui junction is a steep grade drop that is seriously eroded and very slippery. Constructing steps appears to be the only reasonable solution as there is no reroute possibility. Steps must allow for drainage during high rainfalls by ditching alongside and directing water into ditch.

• Between Awaawaphui junction and the Nualolo lookout are several eroded sections of trail with steep drops and dusty hazards during high wind conditions. The tread is badly eroded in places but no realignment is possible. Surface hardening may be the only solution. Turnpike may be appropriate, but this will require further discussion.

• Between Awaawaphui junction and the picnic shelter is the large slope failure with the precipitous trail alignment that is very unsafe. Not only does it require constant digging-out by the trail crew, the slope is likely to fail atop the trail crew as they continue to dig into it. A complete realignment above the slope failure is the top priority of this trail.

**Sign Recommendations**

a. Trailhead
   1. Trail condition and safety need to be clearly indentified (see general recommendations. Hazards lost in the “totem pole of messages)
   2. Given the condition of the trail may want to have hazard sign stand alone.
b. Trail
   1. Mileage markers should be on mile intervals if at all.
   2. Bad trail chutes, etc. could be marked with pictographic warnings.

c. Destination
   1. Improve landing and end of trail sign at overlook
      Great opportunity for interpretive sign.

11. Awaawapuhi Trail  Division of Forestry and Wildlife  6/15/02

Hazards
- Dangerous spur trails off of lookout invites use outside of safety zone
- Dangerous dead snags over trail
- Undercut trail at mile 1.75 has steep drop and serious consequences
- Low mile markers are difficult to see and may trip hikers

![Photo 27 – Downed Tree Limbs on Trails](image)
Photo 28 – Steep Drop off at the End of Trail with No Protection or Interpretation

Photo 29 – Steep Drop off with Deteriorating Railing and Stabilizing Vegetation
Mitigation

- Comprehensive site plan at lookout
- Re-route (contour) steeply eroded section
- Clear snags and general trail maintenance
- Erase spur trails at lookout to prevent ridge hiking to dangerous location
- Design a viewing area that allows visitors to view the ocean below and provide additional seating along slope to sit down. Interpretative signing would be helpful at the viewing area. Viewing deck will allow visitors to see over vegetation and not be encouraged to move too close to the edge for a photo opportunity.
- Once viewing deck is built, encourage re-growth of vegetation up to deck to discourage visitors from wandering too close to the edge.

Trail Recommendations

- Fix or replace trail junction sign (at Cliff Trail junction)
- Reduce mileage markers to every mile to minimize signage
- Rate trail more difficult until re-route and tread mitigation
- Monitoring of visitor use patterns with counter pads could aid in justifying expenditures on trail revitalization

Sign Recommendations

a. Trailhead
   1. Information is sparse but neat (see general recommendations)

b. Trail
   1. Put interpretive material on Web
2. Mile markers-low and trip traps (this is true on many trails)
3. Trail in generally in great shape.

c. Destination
   - Move “end of trail” sign to end of trail.
   - May want to change “Vistas” sign to “Viewing areas”
     - Sign the Valley names from each viewing area.

12. Cliff Trail - Division of Forestry and Wildlife 6/15/02

Hazards
- Two landslide zones at mile 0.5 are dangerous
- Boulders in trail before stream crossing

Mitigation
- Minor re-route near north end of Nualolo Flats to prevent overgrowth hiding steep drops.
- Continuous maintenance at landslide zone
- General trail maintenance (brushing)
- Keep people away from steep drops by maintaining tread and re-routing trail
13. Diamond Head Trail  Division of State Parks
6/17/02

Hazards
- Poor fencing
- Handrails too large
- Uneven surface
- Short drops at edge of concrete path
- Hardened shoulders don’t drain water
- Switchbacks have eroded trail (rock fall potential beneath eroded slopes)
- Low pipes in tunnel
- Separated hand rail before tunnel
- Handrail only on one side of spiral staircase
- Signs have different formats and are therefore confusing
- Smoking near fire hazards
- Guy wire on tree near entrance station
- Small restroom
- No lights in tunnel and spiral staircase
- Dangerous curbing at first lookout
- Limited Japanese on signs (40% Japanese visitation)
- Wearing Turf due to Commercial Activities

Photo 32 – Deteriorating Railings and Trail
Photo 33 – Loose Rock and lack of Vegetation Stabilization

Photo 34 – Commercial Activities Eroding Turf Conditions leading to slippery walking conditions
Photo 35 – Deteriorating Stairs, lack of lighting inside Tunnel

Photo 36 – Rusty, Metal Artifacts on Ceiling and Walls
Photo 37 – Deteriorating Bunker Conditions cause falling rock and concrete hazards
The Risk Assessment Team (RAT) assessed a sample of Oahu's designated trails between June 17 and June 19, 2002. Trails and other recreation resources were assessed for hazardous conditions and associated risks. This project was conducted in collaboration with the USDA Forest Service.

June 30, 2002

Map 4 – Oahu Trails Inventoried
Mitigation

- Standardize railings
- Clean up tread with continuous smooth surface
- Stabilize cliff sides at switchbacks with appropriate materials
- No smoking signs
- Analyze visitor capacity in order to set quotas to avoid dangerous conditions at trail “pinch points”. This problem may be alleviated as master plan is implemented and additional trails are constructed and opened to the public.

Sign Recommendations

a. Trailhead
   1. General Information good, but too many signs of regulatory nature, particularly the park closure time.
   2. Move vendor (1st amendment) and signs.

b. Trail
   1. Too many regulatory signs along trail
   2. Improve sign attachment methods to look more finished and professional.

14. Peacock Flats Camp  Division of Forestry and Wildlife  6/17/02

Hazards

- Dangerous Eucalyptus trees (falling branches)
- Long one-way access road
- No fire rings

Photo 38 – Dangerous buildup of Fuel Loads Surrounding Camp
Photo 39 – Broken Limbs from Mature Eucalyptus Trees Cause Severe Overhead Hazard
Map 5 – Detailed Map of Peacock Flats Camp

Peacock Flats Campground was assessed by the Risk Assessment Team on June 17, 2002. Dangerous Eucalyptus trees are located in and around Campground A. Falling limbs will land in the campground area.

Feature locations are not exact and are intended for graphical representation only. This project was conducted in collaboration with the USDA Forest Service.

June 30, 2002
**Mitigation**

- Cut down all Eucalyptus trees near campsites
- Install iron fire rings
- Limited entry to mitigate road capacity problems
- Close Campground A until Eucalyptus trees are removed (high priority)
- Open up views along the north end of campground to provide for better views to the ocean.

**Sign Recommendations**

a. Entrance signs, improved to contain information in a more friendly way.
b. Site identification sign (white) should reflect family of signs colors and design.
c. Fire safety and education signs may be needed.

15. **Maakua Gulch**  Division of Forestry and Wildlife  6/18/02

**Hazards**

- Flash floods and no escape zone
- Slick rocks
- Dangerous Toyota van wreckage near beginning of trail
- Rock fall

![Photo 40 – Slippery Rock Walking Surface](image-url)
Mitigation

- Remove van
- Add sign at trailhead noting difficulty, limited rescue potential, falling rocks, and slippery trail.
- De-commission trail
Sign Recommendations

Currently closed. Recommend trail be removed from trail system and manage as general forest reserve land not as a trail. Remove trail related and other signs.

16. Sacred Falls Trail  Division of State Parks
   6/18/02

Hazards

• Falling rocks
• Difficult stream crossing
• First chain gate at entrance is hazardous

Photo 43 – Falling Rocks and Dangerous Land Slides
Mitigation

• Close until legislative decision
• Tunnel from safe area to viewing area
• Install gate at entrance

Sign Recommendations

Currently closed. Keep closed and sign accordingly.

17. Wiliwilinui Trail  Division of Forestry and Wildlife  6/1902
This trail certainly qualifies for “most difficult” classification due to continuous steep grades and slippery, muddy conditions. Incredible views can be obtained during when viewing conditions allow.

Hazards

• Loose tree limbs at beginning of trail
• Guy wires at saddle
• No fence around propane tanks and power facility
• Dangerous ropes on trail are anchors to insecure roots and trees
Photo 45 – Slippery, Eroded Trail Conditions
Mitigation

- Trim dangerous limbs
- Re-route trail to avoid guy wires
- Build fence around power facility
- Remove all ropes and construct steps at steeply eroded trail sections

Trail Recommendations

- The first section out of the parking lot has plastic lumber retaining steps which may wash out over time due to lack of drainage. Ideally, drains would be installed everywhere they can reasonably remove water from the treads. This prevents the risers from becoming a tripping hazard as the tread dirt behind them gets washed away.

- The power line intersection (where guy wires are anchored along the trail) could be rerouted to contour along the slope from the lower to the upper saddle. This is the best long-term solution to erosion as the water will move across the trail instead of down and along the trail.

- The steep and narrow ridge zones will require stairs as there is no reasonable side slope to contour along. When constructing stairs try to incorporate landings as
often as feasible to increase safety. The stairs could be constructed atop the original tread trench and the trench may undergo fill in on its own underneath the stairs with vegetation. If not, drain breaks may be needed to slow the erosion.

**Sign Recommendations**

a. Trailhead,
   1. Enter through gated community
   2. Need more prominent sign at gate house
   3. Trailhead information at beginning of stairs may need to be move to parking areas where people begin hiking.
   4. Improve safety and trail condition information at this point.

b. Trail
   1. Pictographic warning of specific trail chutes and cliff areas

c. Destinations
   1. Cliff warning pictograph may be needed.
      Small interpretive sign may be desireable.

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**18. Maunawili Falls Trail** Division of Forestry and Wildlife  6/19/02

A reconstructed and well, maintained trail that vastly improved the eroded and slippery conditions of the original trail. The recycled lumber has so far withstood the heavy traffic. Gravel is a smart addition as it drains well and prevents washout of the risers. Some gravel has been lost from behind the plastic lumber risers because sides were not constructed to retain the gravel and it has been kicked out. The risers work best when they are only 2 x 6 inch material since the step height is lower and people are more likely to use them. In places where the steps are higher the traffic has diverted along the edge and is contributing to further erosion and trail widening. The trail hazard to watch for is exposed risers that trip hikers on their descents.

The new trail location on the ridge top is nicely done. It allows good views up the valley and uses durable trail surface that should require minimal maintenance.

The primary hazard appears to be the falls and pool at the end where jumping from slippery rock cliffs can be dangerous. The trail itself is one of the best we’ve seen.

**Hazards**

- 2.5 foot by 2.5 foot hole at spring portal near trail
- Leptosporosis
- Cliff jumping
- Falling rocks at pool
Photo 47 – Spring Opening Hazard

Photo 48 – Water Fall Jumping and Diving Hazard
Mitigation
- Weld bars or plate on spring portal
- Post “no cliff jumping” signs at pool

Sign Recommendations

a. Trailhead—Did not get to see trailhead, but situation with the community and private land is problematic.
b. Trail—excellent work has been done on this trail, signing is prone to vandalism but is generally good.
   Destination—need “no jumping or diving” at pool.

19. Kaiwa Ridge Trail  Division of Forestry of Wildlife  6/19/02
This trail has never been reconstructed and receives no maintenance attention. It is a dry, ridge trail that appears to get most of its use from residents of the local community whose backyards it traverses.

The beginning climbs steeply from the roadside trailhead between two fences that severely limit the corridor location. This section is overgrown but passable. About 80’ up, however, the trail becomes very steep and eroded as it directly ascends toward the ridge.

Hazards
- Limited parking area
- Steep eroded trail
- Dangerous un-maintained bunkers with exposed rusty metal and suspect concrete
Mitigation
This trail should be redirected to contour along the slope at a much gentler grade. It appears it would be possible to achieve less than 15% grade on most of this trail with proper layout. It would be an ideal project for a mini-excavator. It could regain the saddle at some spots to keep the breezy, good view that is attractive.

With proper community support this could be a well-designed, durable trail, but it now has several hazardous drop offs along narrow ridges and many a steep gully.
- Trail contouring to control erosion
- Construct safe parking area
- Rehabilitate bunkers to safety standards

Sign Recommendations
a. Trailhead—no trailhead signs or indication of trail due to community and private land surrounding trail access. No signs should be added at this time. Community support and input will be needed. Exception to this could be parking signs for trail users along road.
b. Trail—no signs at this time
   Destination—no signs at this time
20. Iao Valley State Park  Division of State Parks  
10/21/02  
Small 6 acre park  
Day use  
1000 people a day  
tour buses  
botanical garden with historical interpretation  
locals use on weekends  
parking, restroom, paved trail, bridge over stream, view of Iao Needle, hand rails,  
private land adjacent to park, trespass issues, possibility of purchase by Maui County

Hazards
Hand rails not to code, space between upper and lower rail  
Rock wall, only two feet tall  
Hand rails on bridge, height not adequate  
Uneven and inconsistent surface, asphalt and concrete  
Shelter at top, sloping slab, gap between slab and handrail, exposed step edge  
View area (battle interp) old concrete protrusions, inconsistent surface  
View area of Needles (just across bridge) not adequate, crowding issue, dropoff  
Width of trail along river too narrow, dropoffs  
Undercut concrete steps  
Side trails, illegal trails

Mitigation
Modify handrails, raise height, fencing or slats to prevent fall through  
Resurface trails and viewing areas  
Bridge, increase height of railing
Iao Valley State Park

Hazards
Iao Valley State Park
Hand rails not to code, space between upper and lower rail
Rock wall, only two feet tall
Hand rails on bridge, height not adequate
Uneven and inconsistent surface, asphalt and concrete
Shelter at top, sloping slab, gap between slab and handrail, exposed step edge
View area (battle field) old concrete protrusions, inconsistent surface
View area of Needles (just across bridge) not adequate, crowding issue, dropoffs
Width of trail along river too narrow, dropoffs
Undercut concrete steps
Side trails, illegal trails

Map 6 – Iao Valley State Park and Associated Hazards
**Sign Recommendations**

At trailhead, better entrance sign identifying the park
Replace/remove “NO…” sign on restroom
Identify hazards at trailhead (stay on trail, water)
Pictograph showing curb hazard, stepping off trail
Plant interp signs need to be brought up to standard
Parking area signing TOO MUCH, all on tall posts

**21. Makena State Park** Division of State Parks
10/21/02
Area consists of three major beaches (Oneuli, Little and Oneloa)
Day use (Oneloa 500-800/day, Little 200/day)
Cultural property (cinder cone) between Oneuli and Little)
Easy access to Oneloa, paved parking area
Road to Oneuli is winding dirt with uneven surface
Trail from Oneloa to Little in a chute, cinders

**Hazards**

Trails coming down off cinder slopes
Rock fall from upper slopes

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*Photo 53 – Rock fall Sign*  
*Photo 54 – Rock fall Zone and Little Beach Trail*

**Mitigation**

User trail above trail between Oneloa and Little needs barrier and restoration
Map 7 – Makena State Park, Ahihi Kinau Natural Reserve & La Perouse Unencumbered Lands

Hazards
Ahihi Kinau Natural Reserve Area

- Exposure to heat and sun, dehydration
- Sharp rocks
- Cracks and crevasses
- Awkward protrusions
- Parking and walking on narrow road ("gray areas")

Hazards
Makena State Park

- Trails coming down off cinder slopes

Hazards
La Perouse Unencumbered Lands

- Normal beach and ocean hazards

Map 7 – Makena State Park, Ahihi Kinau Natural Reserve and La Perouse Unencumbered Lands and Associated Impacts
Sign Recommendations
Identify the area as cultural property
Better entrance signing
Relocate “no hiking signs”, put in tread
Consistent signs on posts, not multiple regulatory and warning
Don’t overlay new sign on old sign
Move trail hazard warning sign around corner to approach to trail to Little
Remove two blank signs on way to Little

22. Ahihi Kinau Natural Reserve Area Division of Forestry and Wildlife
10/21/02
15-40/day
commercial use
snorkel and kayak use
most recent lava flow
trail off road and through lava field to ocean

Hazards
Exposure to heat and sun, dehydration
Sharp rocks
Cracks and crevasses
Awkward protrusions
Parking and walking on narrow road
“gray areas”

Photo 55 – Sharp lava rock with cracks
Mitigation
Identify trail access from road
Identify length of trail

Sign Recommendations
Standard beach area signing at destination
Additional delineation along some areas of trail (rocks)

23. La Perouse Unencumbered Lands Lands Division
10/21/02
“Unmanaged site” with parking, interp signs, and garbage service
Commercial uses, launch for kayaks
Archeological sites
Fish trap area
Private land, recreation use trespass

Hazards
Normal beach and ocean hazards

Mitigation
Management plan for area
Regulate commercial use
Consider restroom facility

Sign Recommendations
Standard beach signing
Better identification of land ownership, uses and regulations
24. **Hoapili Coastal Trail** Division of Forestry and Wildlife
10/21/02
historic trail following king’s highway along maui’s southern coastline
lava flow

*Hazards*
Exposure to heat and sun, dehydration
Sharp rocks

![Photo 58 – Exposure to Sun and Lava](image)

*Mitigation*
Identify trail access from road
Identify length of trail

*Sign Recommendations*
Interpretive signing
Mileage to destinations
Hazard identification

25. **Waikamoi Nature Trail** Division of Forestry and Wildlife
10/22/02
nature trail providing nice loop, .4 mile
first stop on Hana Highway
100-150/day, mostly tourists
limited parking 10 cars
two scenic overlooks
gravel beds, steps

Hazards
Limbs falling out of trees
Blind curve, cars stopping
Exposed roots, tripping and slipping hazards
Steep decent to 2nd viewing area, with bench
Steep dropoff from overlooks

Mitigation
Continue gravel box steps
Railing
Wide tread
Needs new orientation sign
Increase parking

Sign Recommendations
Entrance sign, clean messages, drop “restroom” note
Road hazard, cars stopping ahead
Slipping hazard sign
Falling branches
Waikamoi Nature Trail

Hazards
Waikamoi Nature Trail
Limbs falling out of trees
Blind curve, cars stopping
Exposed roots, tripping and slipping hazards
Steep descent to 2nd viewing area, with bench
Steep dropoff from overlooks

Trails were assessed by the Risk Assessment Team October, 2002. The Team was accompanied by Hawaii State Park Representatives.

Map 8 – Waikamoi Nature Trail and Associated Hazards
26. **Puohokamoa** Division of Forestry and Wildlife
10/22/02
short walk, flat surface, shelter at end with waterfall
500 people/day
trail could be made accessible

*Hazards*
Parking, cars
Slippery trail
Slick rocks

*Mitigation*
Parking
Signs, caution pedestrians

*Sign Recommendations*
Signs placed at end of trail
Slick rocks
High water

27. **Haipuaena** Division of Forestry and Wildlife
10/22/02
short trail to waterfall
parking for 10 cars

*Hazards*
User trail to top of falls
Slick trail, muddy
Cars, parking, crossing the bridge to access feature
Mitigation
Signing

Sign Recommendations
Caution pedestrians
Slick trail

28. Kaumahina State Wayside Park Division of State Parks
10/22/02
15-20 parking spots, tour vans
popular stop, ½ way to Hana
picnic sites, restrooms, garbage
1000/day

Hazards
Roots
Mitigation
Define trail and improve surface (boardwalk planned)
Create nice platform area for final view site

Sign Recommendations
One sign about slippery conditions
Remove “NO” sign
Interpretive sign at overlooks
Eliminate double “watch your step signs”

29. Keanae Arboretum Division of Forestry and Wildlife
10/22/02
½ mile paved trail, ¼ mile of unpaved
many plants of the pacific rim
30 years old
streamside, park like setting
trail could be made accessible

Hazards
Falling branches
Have to walk over hazardous terrain to read signs
Collapsed wall and pavement edge
Rail was gone where car crashed
Pool jumping
Photo 65 - Falling Branches and Difficult Walking Conditions

Mitigation
Make signs larger
Repair wall and undercut
Continue pavement or create destination
Remove old rusty tank

Sign Recommendations
Make signs larger so you can read from trail
No swimming

30. Puaa Kaa State Wayside Park Division of State Parks
10/22/02
wayside park with restrooms, picnic, phone and trails
falls and pool destination
Hazards
Highway crossing dangerous, congestion
Lower picnic area in unsafe location
Railing across creek confusing
People travel down old gravel road, gated at bottom

Mitigation
Create destination at end, pool and waterfall viewing area
Remove paved trail and handrail from other side of creek
Block access down old gravel road

Sign Recommendations
Remove “NO” regulatory sign
Sign on highway, warn about pedestrian crossing

31. Waianapanapa State Park  Division of State Parks
10/22/02
cultural park, beach, caves, 120 acres, camping, swimming, cabins, blow hole

Hazards
Swimming
Viewing ocean, viewing blow hole
No life preserver in kiosk
Loose rock steps
Uneven pavement
Edge and handrails
Photo 68 – No Life Preserver

Photo 69 – Uneven Surface and Inadequate Handrails

Mitigation
Resurface trail
Brush trail out, low overhanging vegetation
Create safe viewing areas for blow hole
Create trail along blow hole area
Match handrail with edge of pavement

Sign Recommendations
Too many signs, need to do a sign plan
Standard signs with shapes and colors
Beach sign group was too congested
Blow hole sign from other direction
32. **Nahiku Landing** Lands Division
10/22/02
viewing site at bottom of long winding road

*Hazards*
Undercut edge encroaching parking area
Cable railing
Cable cutting into trees

![Photo 70 – Unprotected undercut edge with encroaching vehicular parking](image)

*Mitigation*
Move parking back
Use better fencing option
Direct people to safe viewing area

*Sign Recommendations*
Regulatory signs in a readable location
Standard warnings about terrain and access
33. Lahaina Pali Trail Division of Forestry and Wildlife
10/23/02
old king’s highway, historic trail, rock work
5 miles in length
significant historic features
top elevation 1600’
more difficult

Hazards
Trailhead access nearest Kahulai (Kahekili Hwy) guard rail with sharp turn
Heat, sun, loose rocks
Fire hazard
Lahaina trailhead and trail leads you to collapsed bridge structure

Photo 71 – Blocked Trailhead Access and Dangerous Entrance from Highway
Mitigation
Better fire prevention, no smoking
Maintain and improve drainage structures (maintain historic look)
Create safe access to trailhead, possible relocation of parking area next to highway
Relocate beginning of Lahaina trail to create better flow from parking area to actual trail

Sign Recommendations
Entrance signing (once access problems corrected) on Highway
No smoking sign

34. Mokuleia Beach Conservation Area  Division of Forestry and Wildlife
10/23/02
500 foot staircase, access to beach area
concrete steps with rails, ends at high water mark
parking, 20 spaces, both sides of road

Hazards
Parts of handrail do not meet standard
Parts of the steps were chipping
Transition from steps to beach was challenging
Falling rocks
Traffic, people crossing highway to get to stairs
Mitigation
Raise height of handrails
Create better transition from steps to beach

Sign Recommendations
Standard beach hazard signing
Falling rocks
Entrance signing
Highway caution, pedestrians

35. Kahakuloa Game Management Area Division of Forestry and Wildlife
10/23/02
1200 acres, managed for hunting, coastal zone
no hunting between road and the ocean
 gated access, check station

Hazards
Mixing hunters with other recreationists
Mitigation
Maintain limited access

Sign Recommendations
Provide safety information at check point
Upon entering area, sign notifying people of hunting in area
Larger entrance sign

36. Ohai Trail (proposed) Division of Forestry and Wildlife
10/23/02
preliminary discussions about potential development and hazards

37. Waihee Ridge Trail Division of Forestry and Wildlife
10/23/02
access through Scout camp
2.5 mile trail
open ridges and native plants
vistas

Hazards
Falling branches
Slick trail surface
Open trenches at picnic vista at trail’s end
Mitigation
Drainage work
Fill trenches at top

Sign Recommendations
Stay on trail

38. Kula Forest Reserve Division of Forestry and Wildlife
10/24/02
7000 acres including the State Park
opening/closing weekend 100 hunters
leased land from ranch
bird, pig and goat hunting
recreation trails transect hunting areas

Hazards
Shooting
Uninformed recreationists entering hunting area
Fire hazard, one way in/out
Mitigation
Provide information to both hunters and recreation users

Sign Recommendations
Posting seasons for species (opening closing dates)
Consistent trailhead identification and information

39. Polipoli Springs State Park Division of State Parks
10/24/02
6 acre site within Forest Reserve
rental cabin, in high demand
campsites, permits issued

Hazards
Potable water
Trees (eucalyptus)
Fire hazard, heavy fuels
Ingress/Egress for emergencies, one way in/out
Cabin hazard, propane tanks not secured, lines into cabin not to code
Access road, guardrails and posts across stream crossings
Ash Pit and piles of torn up concrete
Mitigation
signing
remove hazard trees
fuel treatments
fire planning for safety zones and ingress/egress
consistent guardrails/barriers at stream crossing
Ash pit is area away from fuels

Sign Recommendations
Narrow road, slow down
No camping outside developed camp area
Entrance sign
Replace NO…… sign
Not Potable Water sign on water faucet
No fires outside campground

40. Polipoli Trail Division of Forestry and Wildlife
10/24/02
.6 mile through forest to overlook

Hazards
Falling branches
Confusing trail signs at top
Heavy fuels
Photo 79 – Confusing Trail signs along the Polipoli Trail

Mitigation
Barricade trails not approved for use
Fuel treatments

Sign Recommendations
Remove plywood signs
Place signs on post
Fire prevention message

41. Proposed Horse/Mountain Bike Trail Division of Forestry and Wildlife
10/24/02
preliminary discussions about potential development
concern about need for a short (1 mile) horse trail
steep side slope and need to build trail wide enough for horses to pass

42. Waihou Springs Trail Division for Forestry and Wildlife
10/24/02
1.3 mile trail through experimental forest and down into a canyon

Hazards
Falling rocks
Slippery trail surface
First corner below overlook bench has roots and rocks
At trail’s end, the user trail continues into drop zone
Mitigation
Signing
Create viewing area at end of trail, rock wall
Interpretive sign describing tunnels

Sign Recommendations
Rock fall
Remove Forest research signs
Caution sign at overlook bench, consider remainder as a “more difficult” trail
End of trail

43. Pala’au State Park  Division of State Parks
10/25/02
scenic overlook of historic Kalaupapa
short trail to phallic stone
picnic and camping within ironwood grove
camping by permit only
233 acres
20-75 people/day

Hazards
Slippery roots on way to overlook
Paved area at lookout has protrusions
Hand rails at lookout were rusting and breaking at welds
Where hand rails end, people continue to edge of cliff
Limbs and trees falling in and around camping and picnic areas
Lumber pile around restroom in camping area
Mitigation
Extend and replace hand rails at lookout
Surface trail to lookout, remove protrusions, could be accessible
Clear additional trees around and in camping and picnic areas
Sign difficulty rating for phallic rock trail
Remove lumber pile from restroom in camping area
Sign Recommendations
Slippery trail
Danger, cliff area signing at end of handrail at lookout
Better Park entrance signing, near trailhead to Kalaupapa
Campground entrance sign
Phallic rock interpretive sign should be mounted on posts
Campground boundary signing, no camping beyond this point

44. Molokai Forest Preserve Division of Forestry and Wildlife
10/25/02
4 WD road, limited turnouts
waikolu lookout and picnic area

Hazards
Limited signing on trail/road conditions
Limited turnouts
Steep, Slippery road
Limited sight distance
Spacing between hand rails and fence at lookout

Mitigation
Signing on road conditions
Improve fencing and remove gaps at lookout, consider a gate if access is necessary
Sign Recommendations
4WD only beyond lookout/picnic area
Limited sight distance and turnouts
Trail crossing signs, where trails cross 4 WD road
Repair site identification sign at sandalwood pit and consider interpretive sign

45. Kahaualea Natural Area Reserve Division of Forestry and Wildlife
10/28/02
reserve next to Hawaii Volcanoes National Park on eastern slope of Kilauea Volcano
Captain’s trail, 3.7 miles in length, most difficult
ohia-tree fern forest, terminates at lava flow

Hazards
Slippery roots
Mud holes
Fissures, cracks
Low hanging branches
Multiple trails
Lava flow hazards (unstable ground, loose rock, cracks, holes, sharp)
Abandoned vehicles at trailhead

Photo 84 – Abandoned Vehicles, damaged signage at trailhead
Photo 85 – Difficult Trail conditions with mud, exposed roots

Photo 86 – Deep fissures along trail
**Mitigation**
Remove abandoned vehicles and grade parking area
Trail maintenance program (cut limbs, improve stepping logs in bog areas)
Standard trail blazes
Close off multiple trails
Bridge the BIG CRACK (3’x 6’ bridge)

**Sign Recommendations**
Destination and mileage sign
Trailhead identification
Hazards
Additional lava flow hazard signs to create a visual barrier

**46. Muliwai Trail  Division of Forestry and Wildlife**
10/29/02
7 mile trail from Waipio valley to Waimanu Valley
high use, permitted camping, beach access
shelter at halfway point
4 helispots along the route
brushing quarterly, and other maintenance twice per year
more to most difficult

**Hazards**
Pig damaged trail tread
High water stream crossings, slick logs at crossings
Slippery trail conditions
Landslides that washed the trail away
Steep trail down into Waimanu valley
Rock fall from upper switchback to the lower one
Concrete slab was undercut (near Waimanu valley)
Bees (1/4 mile above helispot Number 4)
Rock, rubble and leaves create awkward footing
Photo 87 – Landslides and Washed Out Trail

Photo 88 – Pig Damage, rock fall
Muliwai Trail

Hazards
Muliwai Trail

- Pig damaged trail tread
- High water stream crossings, slick logs at crossings
- Slippery trail conditions
- Landslides that washed the trail away
- Steep trail down into Waimanu valley
- Rock fall from upper switchback to the lower one
- Concrete slab was undercut (near Waimanu valley)
- Bees (1/4 mile above helispot Number 4)
- Rock, rubble and leaves create awkward footing

Map 9 – Muliwai Trail and Associated Hazards
Mitigation
Increase hunting of pigs to decrease trail impacts
Increase maintenance interval (especially tread)
Eliminate bees
Additional drainage structures (consider treated timbers)
Cut out logs at stream crossings
Landslide area needs retaining wall (20’ long x 5’ high)
Build steps in and out of gullys (rock or treated timbers)
Concrete slab (break away or build up underneath it)
Brush trees and branches on upslope side to allow traffic closer to slope away from edge

Sign Recommendations
New trailhead signs, with adequate warnings (slippery trail, bees, cliffs, stream crossings, falling rock)
New information sign at Waimanu valley (or just remove it)

47. Onomea Trail  Division of Forestry and Wildlife
10/29/02
½ mile trail, accessing public land adjacent to Botanical Gardens
trail right of way bisects garden, with appearance of limited access
access to beach, river and waterfall areas
limited parking

Hazards
Undercut trail (old road)
Traffic on road
Creek crossing
Beach area, rocky, high water, rough waves, undercuts
Awkward footing, vegetation on trail surface
**Mitigation**
Stream crossing, make approach on north side more obvious
North side, clear tread and define best path
Create safe viewing area for beach
Landslide area under old road, confine trail to inner path (w/ natural barriers)
Onomea Trail

Hazards
Onomea Trail
Undercut trail (old road)
Traffic on road
Creek crossing
Beach area, rocky, high water, rough waves & undercuts
Awkward footing, vegetation on trail surface

Trails were assessed by The Risk Assessment Team October, 2002. The Team was accompanied by Hawaii State Park Representatives.

Map 10 – Onomea Trail and Associated Hazards
**Sign Recommendations**

Uniform signing (currently have green signs, some hazard sign), should be Na Ala Hele
New trailhead signs, with adequate warnings (slippery trail, cliffs, stream crossing)
Better route identification through botanical area
Pedestrians Ahead at two trailheads
Standard ocean signing
High water stream crossing sign
Remove green private signs from Na Ala Hele section
Remove old, weathered, bent signs

**48. White Road Trail**  Division of Forestry and Wildlife  
10/30/02  
Waimea Reservoir to Upper Waipio Valley  
Restricted access, two gates, park on road in residential area  
Follows irrigation flume, numerous man-made caves and bridges

**Hazards**

Flumes  
Caves  
Overgrown trail, forcing traffic to outside edge  
High water stream crossing  
Collapsed bridge  
Trail tread collapsing  
Holes in tread  
Overlooks with no defined safe viewing zone  
Steep cliffs  
Slippery bridges
Mitigation
Steep side hills, brush out the inslope side
Keep hikers away from edge with barriers and eventually vegetation
On grades exceeding 25%, place steps
Collapsed bridge, block abandoned route
Map 11 – Muliwai and White Road Trails and Associate Hazards
Sign Recommendations
trailhead signs with adequate warnings (slippery trail, cliffs, stream crossing, stay off flumes, stay out of caves)
slippery trail
stream crossing
remove “no trespassing” signs, message not clear
keep off flumes
consider interpretation signs

49. Wailuku State Park  Division of State Parks
10/31/02
Rainbow Falls viewing area, popular stop for tour buses, capital investment project to improve circulation and make ADA compliant, 500 people/day
Boiling pots viewing area, series of drop pools and cascades, 100 people/day

Hazards
Rainbow falls handrails end too early, bridge needs taller railing, lower secondary viewing area, invites access to cliff area
Boiling pots handrails too low and gap between two rails, water hazards of strong currents and undercuts, difficult to exit out of river
Trail to upper Rainbow Falls overlook is narrow with two way traffic

Photo 93 – Handrails old, rusty and not to standard
Mitigation
Extend and improve handrails
Close access to cliffs and river
Re-establish loop trail to upper Rainbow Falls overlook to improve circulation

Sign Recommendations
No access beyond this point, instead of stay back
Slippery trail

50. Akaka Falls State Park Division of State Parks
10/31/02
½ mile paved trail accesses Kahuna Falls and Akaka Falls, through lush tropical vegetation, 300 people/day

Hazards
Handrails need repair (rusted with exposed sharp edges)
Handrails too low (especially concerned at Akaka Falls overlook)
Pavement transition from flat to steps
Uneven steps
Narrow stairway at start
Low stone wall in picnic area
Entrance into parking area abrupt
Step off back of men’s room entrance
Moss on trail surface
Photo 95 – Uneven, narrow steps with low handrails

Photo 96 – Low railing at major vista
Akaka Falls State Park

Hazards
Akaka Falls State Park

Handrails need repair (rusted with exposed sharp edges)
Handrails too low (especially concerned at Akaka Falls overlook)
Pavement transition from flat to steps
Uneven steps
Narrow stairway at start
Low stone wall in picnic area
Entrance into parking area abrupt
Step off back of men's room entrance
Moss on trail surface

Map 12 – Akaka Falls State Park and Associated Hazards
Mitigation
Fix handrails
Backfill around back of men’s room step
Paint transition from flat pavement to steps
Widen stairway
Add handrail to stone wall next to picnic area
Level steps
Remove non-functional water faucet
Remove moss from sections of trail

Sign Recommendations
Warning sign for approach to entrance/parking area
Entrance sign needs to be more visible
Trail length sign, move up to start of trail
Trail difficulty, what to expect (ie. 1/2 mile paved trail, 500’ elevation gain, 100 steps)
Slippery trail

51. Kalopa State Park  Division of State Parks
10/31/02
State Recreation Area, lodging, camping, picnicking, nature study
.7 mile Nature trail, additional trails in adjacent Forest Reserve

Hazards
Falling branches, decadent trees
Route finding on Nature trail
Roots and slick trail surface

Photo 97 – Tall mature trees and falling branches
Mitigation
Remove hazard trees around pavilion and camping area
Improve blazing and directional signing on nature trail

Sign Recommendations
Trail junction signs
Trail blazes
Nature trail, interpretive signs need to be located closer to feature
Nature trail signing: slippery trail

52. Kekana Kai State Park Division of State Parks
11/01/02
multiple beaches north of Kona
limited directional signing
some restroom facilities

Hazards
Rough access roads
Abandoned facilities and cars
Mitigation
Sign road as 4WD only or improve maintenance
Remove abandoned buildings and vehicles
Define parking areas

Sign Recommendations
Increase directional signing
General beach access signing
Risk Assessment Team Members

Garry Oye  Bishop, California
Education: M.S. Forestry 1984, B.S. Forestry 1981, University of Montana
District Ranger, White Mtn & Mt Whitney Ranger District, Inyo National Forest
7 years as Program Leader for Wilderness, Rivers and Trails on 20 million acres of
National Forest Lands within the Pacific Southwest Region of the USDA Forest Service.
Working with State of Hawaii on risk management since 2000, providing training for
local recreation managers and conducting assessments. 24 years experience managing
recreation and wilderness programs on National Forests in Idaho, California, Utah,
Colorado and Wyoming. Experience managing backcountry, trails, ski areas,
campgrounds, scenic highways, interpretive sites, visitor centers and facilities.

Randy Gimblett Tucson, Arizona
Education: Ph.D. University of Melbourne, Environmental Planning, M.L.A. He is a
Professor in the School of Renewable Natural Resources at the University of Arizona.
He has extensive experience in landscape design and planning. Is currently working with
Federal and State agencies on numerous recreation and park planning projects. His major
research interests are in Spatial Dynamic Ecosystem Modeling, Geographic Information
Systems, Landscape Simulation and Recreation Behavior Modeling. His recent work
involves the visitor use monitoring and applications of technology to improve the use of
research in recreation assessment and management.
John Hoagland, Salt Lake City, Utah

Education: BS degree in Economics from University of Utah, 1972. MS degree in Forest Science Management, Utah State University, 1974.

27 years of service with the USDA Forest Service in resource economics, wilderness management, recreation and winter sports administration. Retired 6/3/02 as Director of the Intermountain Region’s 2002 Winter Olympic Planning Team.

5 years as Regional Winter Sports Coordinator working with Ski Area, Helicopter skiing, Cross Country Skiing permits and outfitters.

5 years as District Winter Sports Administrator working with ski area managers and designers on all aspect of resort layout and facility development including winter and summer trails for skiing, hiking and mountain biking.

2 years as District Summer Recreation Administrator, which entailed managing the Districts trail system, developed recreation sites, summer homes, dispersed recreation program, interpretive and information programs.

4 years on Frank Church River of No Return Wilderness Team with responsibility for river management, archeological resources, trail condition surveys, trail safety and risk assessments, trail capacity and trail removal or relocation studies.

Erik Murdock, Tucson, Arizona

Education: Ph.D. Student in the School of Renewable Natural Resources at the University of Arizona.

Extensive experience with Geographic Information Systems, Global Position Systems and field assessment of recreation monitoring and behavior. His recent work I monitoring visitor use with trail counters and survey methodologies coupled with his knowledge of spatial systems is leading the way in better understanding recreation use, risks and associated impacts.
John Neary, Juneau, Alaska

Education: BS in Parks and Recreation Administration, Colorado State University, 1982. He has been working for the Forest Service as a wilderness field manager on Admiralty Island National Monument for 19 years, with a break to serve as a Peace Corps Volunteer on a wildlife/eco-tourism project in Rwanda. John's present duties largely involve supervising cabin and trail maintenance crews, administering guide permits, managing the Pack Creek Bear Viewing Area on Admiralty Island, and supervising a sea kayak ranger program. John has also worked internationally in Uganda for the Peace Corps and in South Africa for the US Forest Service International Program.

John’s specific experience in trails includes inventorying and documenting trail conditions, prescribing and supervising repairs and reconstruction, procuring materials, mobilizing field crews in remote areas and other logistic details. Southeast Alaska soil conditions are generally steep and muddy due to abundant rainfall, and trail work involves large investments in time and money.

Other risk assessment management duties include 15 successful years of managing human interactions with grizzly bears at an internationally known bear viewing area.
Bruce Ungari  Camino, California

Education: BA degree in Parks and Resource Management from California State University, Chico, ‘75. AA degree in Behavioral Science from San Jose City College, 27 years of federal experience working in the field of recreation. Recently retired (4/3/02) from the US Forest Service Regional Office (R4) as the Olympic Event Services Coordinator for the 2002 Winter Olympics. Currently assigned to a National Type 1 Incident Management Team.

12 years of administering the nations largest special use permit, containing the 4 season resorts of; Vail, Keystone, Breckenridge, Copper Mountain, Beaver Creek and Arapahoe Basin ski areas in Colorado. This position required working closely with resort management assessing inherent/ designed risks of mountain biking, hiking and ski trails, including dealing with and average of 5 deaths per year. Managed resource impacts from 20 million dollars average/year of construction projects, including route selection and layout for hiking, mountain biking and ski trails.

Served as Recreation Manager (13+yrs) for developed and undeveloped recreation including the management of 4 Wilderness areas in California and Colorado, managed over 600 miles of hiking trails. Including, the supervision of district trail crews and Wilderness Rangers. Managed over 30 campgrounds and developed sites, performing annual hazard assessments.
Marty Hornick  Bishop, California

Marty has worked for the Forest Service since 1980, including the position of Trails and Wilderness Manager on the Mt Whitney Ranger District. Worked for six winter seasons as a climbing and ski mountaineering guide. Managed climbing issues on Inyo National Forest, and has participated in multiple national teams tasked with developing policy and direction for management of climbing on Forest Service and Wilderness lands. Marty is a state and federally certified blaster, and has used explosives in his work throughout the past two decades.

Marty manages the construction and maintenance of 1200 miles of mostly wilderness trails on the Inyo National Forest. Has extensive experience surveying and collecting data on trails – and developing prescriptions for hazard removal and resource protection. As project leader for various complex trail, bridge, and blasting projects – primarily in remote wilderness areas, Marty frequently manages potentially severe hazards to the public, property, and his own employees. He has attended national Risk Managers’ conferences and instituted successful safety programs for a complex trail program. Marty was a member of the Forest Service Risk Assessment Team that provided training in Oahu in May of 2000.

Currently participating in a national task group developing the Trails module of a nationwide database (INFRA), integrating leading-edge field data collection, storage and management technologies.
Beginning March 1, 1961, all persons wishing to camp overnight in Waimanu Valley must first secure a permit from the Division of Forestry and Wildlife. For more information please contact the Kona office at 969-4221 or write the Division of Forestry and Wildlife, P.O. Box 4849, Hilo, Hi 96720.