

## Rapid Assessment Method Survey Forms (Nutrient and bacteria focus)

SITE INFORMATION			
Survey Area	Date	Time	
Waterbody	Site Name	Evaluator	
Upstream end	latitude	longitude	NAD
Downstream end	latitude	longitude	NAD
General description _____			
Property owner		Contact info:	

WEATHER AND FLOOD CONDITIONS	
Current weather	<input type="checkbox"/> Sunny <input type="checkbox"/> Partly cloudy <input type="checkbox"/> Overcast <input type="checkbox"/> Light rain <input type="checkbox"/> Moderate rain <input type="checkbox"/> Heavy rain <input type="checkbox"/> Other _____
<input type="checkbox"/> Not raining at this site, but rain upstream may be impacting site	
Precipitation in last 48 hours	<input type="checkbox"/> None <input type="checkbox"/> Light <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy <input type="checkbox"/> Snow or sleet
Flood events during last 4 weeks	<input type="checkbox"/> None <input type="checkbox"/> Field evidence (e.g., fresh debris, grasses laid over, fresh bank erosion) Documented by <input type="checkbox"/> Newspaper <input type="checkbox"/> Person _____ <input type="checkbox"/> Currently flooding
<input type="checkbox"/> Drought conditions prevailing	Last significant rain _____

WATER OBSERVATIONS	
Clarity	<input type="checkbox"/> Clear <input type="checkbox"/> Turbid <input type="checkbox"/> Stained <input type="checkbox"/> Opaque <input type="checkbox"/> Oily <input type="checkbox"/> Other (chemical, dyes)
Color	<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Grey <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange/Red <input type="checkbox"/> Other
Odor	<input type="checkbox"/> None <input type="checkbox"/> Fishy <input type="checkbox"/> Sewage <input type="checkbox"/> Chlorine <input type="checkbox"/> Rotten eggs <input type="checkbox"/> Other _____
Dominant substrate	<input type="checkbox"/> Silt/sand <input type="checkbox"/> Gravel <input type="checkbox"/> Cobble (3-10") <input type="checkbox"/> Boulder <input type="checkbox"/> Bedrock
Aquatic plants coverage	<input type="checkbox"/> 1% <input type="checkbox"/> 2-25% <input type="checkbox"/> 26-50% <input type="checkbox"/> 51-75% <input type="checkbox"/> 76-100%
Algae coverage	<input type="checkbox"/> 1% <input type="checkbox"/> 2-25% <input type="checkbox"/> 26-50% <input type="checkbox"/> 51-75% <input type="checkbox"/> 76-100%
Macroinvertebrates	<input type="checkbox"/> Absent <input type="checkbox"/> Rare <input type="checkbox"/> Common <input type="checkbox"/> Abundant
Crayfish and bullfrogs	<input type="checkbox"/> Absent <input type="checkbox"/> Rare <input type="checkbox"/> Common <input type="checkbox"/> Abundant

FLOW REGIME	
Current flow	<input type="checkbox"/> No flow <input type="checkbox"/> Pools <input type="checkbox"/> Trickle <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High <input type="checkbox"/> Flood
Flow (check only one)	<input type="checkbox"/> Perennial – Persists all year <input type="checkbox"/> Intermittent – Dries out part of the year or flows only a few weeks <input type="checkbox"/> Ephemeral – Flows only in response to precipitation <input type="checkbox"/> Interrupted – Flows only in a portion of this reach
Issues affecting flow	<input type="checkbox"/> Seasonal variation primarily due to snow melt <input type="checkbox"/> Uniform flow due to spring sources <input type="checkbox"/> Flow primarily from treated effluent discharges (permit) <input type="checkbox"/> Regulated flow – dam releases, diversions <input type="checkbox"/> Altered flows due to ground water pumping <input type="checkbox"/> Water transfer provides water from another drainage

WATER SAMPLES AND MONITORING		
	Above _____	Below _____
Dissolved oxygen (if flowing)	_____ mg/L Method _____	_____ mg/L Method _____
pH (if flowing)	_____ SU Method _____	_____ SU Method _____
Other _____		

RIPARIAN AND STREAM BANK CONDITIONS		
Elevations and riparian associations	<input type="checkbox"/> Below 3280 ft elev. – Sonoran, Chihuahuan, Mohave, Great Basin <input type="checkbox"/> 3280-5740 ft. elev. – Interior – Cottonwood-willow and mixed broadleaf <input type="checkbox"/> 5740-8200 ft. elev. – Montane – Mixed broadleaf <input type="checkbox"/> Above 8200 ft. elev. – Boreal – Sub-alpine forests	
Width of vegetated riparian ground cover or active riparian filter strip (grasses, shrubs, etc under 2 feet)	<b>LEFT BANK*</b> <input type="checkbox"/> Less than 10 feet wide <input type="checkbox"/> 10-30 feet wide <input type="checkbox"/> 30 or more feet wide	<b>RIGHT BANK*</b> <input type="checkbox"/> Less than 10 feet wide <input type="checkbox"/> 10-30 feet wide <input type="checkbox"/> 30 or more feet wide
Percent ground cover (grasses, shrubs, etc under 2 feet) (Use field chart)	<b>LEFT BANK*</b> <input type="checkbox"/> 5 – 30% <input type="checkbox"/> 40-60% <input type="checkbox"/> more than 60%	<b>RIGHT BANK*</b> <input type="checkbox"/> 5 – 30% <input type="checkbox"/> 40-60% <input type="checkbox"/> more than 60%
Average stream bank slope x feet rise/100 feet = y percent slope	<b>LEFT BANK*</b> _____ percent slope	<b>RIGHT BANK*</b> _____ percent slope
Stream bank stability	<b>LEFT BANK*</b> <input type="checkbox"/> Stable slope with good cover <input type="checkbox"/> Bank angle <input type="checkbox"/> Stormwater causing erosion <input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Abundant Approximate % of bank _____	<b>RIGHT BANK*</b> <input type="checkbox"/> Stable slope with good cover <input type="checkbox"/> Bank angle <input type="checkbox"/> Stormwater causing erosion <input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Abundant Approximate % of bank _____
Trash and debris	<input type="checkbox"/> Not observed <input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Abundant <input type="checkbox"/> Primarily plastic bottles <input type="checkbox"/> Food wastes <input type="checkbox"/> Chemicals <input type="checkbox"/> Large items	

\* Left and right bank are determined looking **downstream**

EVIDENCE OF POLLUTANT LOADING		
Within 150 feet of the surface water		
<b>Urban/subdivision</b>	<input type="checkbox"/> Storm water causing erosion <input type="checkbox"/> Drainage from trash receptacles <input type="checkbox"/> Inadequate riparian buffer	<input type="checkbox"/> Runoff from lawns <input type="checkbox"/> Pet wastes Notes * _____
<b>Waste water disposal</b>	<input type="checkbox"/> Sewered <input type="checkbox"/> Sewer line crossing stream <input type="checkbox"/> Drainage from sewer lines likely <input type="checkbox"/> Treated effluent (golf, discharge)	<input type="checkbox"/> Septic system survey form Notes * _____ _____
<b>Livestock operations</b>	<input type="checkbox"/> Drainage from corrals, pastures, or feedlots <input type="checkbox"/> Inadequate riparian buffer <input type="checkbox"/> Animals have access to stream (lack of fences, animals in water)	<input type="checkbox"/> Lack of alternative water sources <input type="checkbox"/> Animal waste <input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Abundant Notes * _____ _____
<b>Crop production</b>	<input type="checkbox"/> Drainage from fields <input type="checkbox"/> Irrigation return flows <input type="checkbox"/> Inadequate crop filter strips	<b>Notes*</b> _____ _____
<b>Recreation</b>	<input type="checkbox"/> Toilet facilities inadequate* <input type="checkbox"/> Toilet facilities not maintained* <input type="checkbox"/> Human waste observed <input type="checkbox"/> Inadequate riparian buffer <input type="checkbox"/> Pet wastes	<input type="checkbox"/> Marina / boat wastes <input type="checkbox"/> Feeding wildlife (ducks & geese) <input type="checkbox"/> Trash facilities inadequate* <input type="checkbox"/> Trash – wildlife interactions <b>Notes*</b> _____ _____
<b>Fire damage</b>	<input type="checkbox"/> Fire within last 3 years at site <input type="checkbox"/> Fire 3-7 years ago at site	<input type="checkbox"/> Within last 3 years in watershed <input type="checkbox"/> 3-7 years ago in watershed

ATTACHMENTS		
<input type="checkbox"/> Site Sketch	<input type="checkbox"/> Photo Inventory	
<input type="checkbox"/> Septic System Survey Form	<input type="checkbox"/> Other Documents	

\* Note distance from surface water and likelihood of contribution. Judge “adequacy” based on peak use periods, discussions with people maintaining facilities, discussions with users, and observations.

## Field Equipment

- 100 foot measuring tapes or ability to accurately pace off distances
- Bank angle indicator and meter stick/yard stick (for bank slope calculations)
- Camera and Photo Inventory Form
- GPS
- Dissolved oxygen and pH equipment
- Field survey forms
- Septic system survey forms (Still need to develop this)
- Field maps of “survey area” where sites are accurately denoted as they are visited
- Field chart for percent ground cover
- Calculator for percent rise
- Pens, pencils, and clipboards
- Appropriate apparel, drinking water, first aid kit
- Field identification for volunteer (name or volunteer, official contact phone number, etc)

## Site Information

This section is needed so that anyone could find the site again, and so that land owner can be identified and contacted if necessary. Describe site using information that will not change over time. Provide more access information where it will be necessary (roads, who to contact, etc)

- Survey Area name would be established in the monitoring plan
- Record date as: mm/dd/yyyy
- Record time when arrive at site
- Provide a site name – landowner, nearby crossing, (e.g., Verde River downstream of Park Lane)
- Provide descriptive name for upstream and downstream end of segment/site. (e.g., Top of Reach (TOR) at north fence, Bottom of Reach (BOR) at road crossing).
- GPS
  - Be sure that GPS unit is working at beginning of each day.
  - Set GPS unit to NAD 83.
  - Record latitude/longitude as degrees, minutes, and seconds to the thousands (nn nn nn.nnn) or in decimal degrees (nn.nnnnnn)
- Determine landowner name and contact information either by making contact in the field or by research back at the office.

## Weather and Flood Conditions

Field observations will be interpreted using information about current and recent past weather conditions. In particular droughts and storms will intensify nutrient symptoms observed. For example:

- Algal blooms are likely to occur soon after a flood event due to brief periods of nutrient enrichment from the watershed
- Nutrients may concentrate in surface water during droughts, especially if continued source contributions or in pooled water lacking adequate flow through.
- Nutrient recycling (sediments → plants → decaying plants → sediments) may be the major source of nutrients, especially in a relatively static lake system.
- Fecal matter deposited along the stream bank will be washed away during heavy rains and flood flows.
- *E. coli* bacteria concentrations are normally above Arizona’s water quality standards during first flush of flood waters.

## Water Observations

Observations are combined in a “weight-of evidence” approach with other field information to determine excessive nutrient loading. A single line of evidence is seldom sufficient.

- Clarity – turbid, stained, opaque, oily. (Note that small amounts of oily sheen may naturally occur in backwater areas due to break down of plant material, and may not indicate excessive nutrients.)
- Color – brown, grey, yellow, green (from algae), orange/red. Green from copper chemicals or dyes would not be evidence of nutrient enrichment.
- Odor – fishy, sewage, rotten eggs, chlorine, and some other smells
- Substrate – sand/silt frequently indicates excess erosion (from watershed or stream banks) which may be loaded with nutrients. If silt and sand is a dominant substrate, consider quantifying it using ADEQ’s “Pebble Count” methods (see follow-up monitoring).

- Aquatic plants – Larger percentages of aquatic plants
- Algae – Larger percentages of filamentous green algae cover
- Macroinvertebrates – Abundance of macroinvertebrates
- Crayfish and bullfrogs – Both will consume macroinvertebrates

## Flow Regime

Field observations and potential mitigation methods will also be interpreted by information concerning flow regime. For example:

- Some flows are created by primarily by ground water upwelling which is naturally low in dissolved oxygen, an indicator parameter used to evaluate nutrient loading.
- Nutrient introduction is limited to runoff events in ephemeral streams.

Although on the field form, information will need to be researched. Field volunteers will only be able to determine current observed flow in the field.

## Water Samples

It is important to collect measurable data where appropriate. This data can be used to identify sources by comparing values collected above and below a potential discharge area. In most cases nutrient discharges will be occurring only during specific conditions (e.g., runoff events). Samples collected at “key sites” can be used to determine success over time.

- Dissolved oxygen (DO) and pH should be collected at sites with *flowing* water, not in stagnant pools. Collect where flow is greatest, not along edge. Combined in a weight-of-evidence approach, these parameters can be used as indicators of excess nutrient enrichment.
  - Low DO = below 7 mg/L in coldwater (Oak Creek above Slide Rock, Granite Creek above Watson Lake), or below 6 mg/L in warmwater (Oak Creek at Slide Rock and below or San Francisco River).
  - Excess nutrients can be indicated by pH above 9.0 SU.
  - Low DO and high pH are normal in stagnant pools. Low DO is normal in streams with ground water upwelling.

## Riparian and Stream Bank Condition

This is a qualitative quick evaluation of riparian conditions to be added to the “weight-of-evidence” approach to determine if inadequate filtering of runoff may be contributing to excess nutrients. The Proper Functioning Condition evaluation is more quantitative and reproducible (see discussion in “follow-up monitoring.”

- Elevations and riparian associations – indicates broadly the type of reference condition. For example, riparian areas in the Mohave Desert simply will not develop a riparian area that looks and acts like a healthy riparian area along the Mogollon Rim.
- It will be necessary to identify “reference sites” and measure conditions in those sites to properly evaluate all other sites.
- Filtering capacity of the riparian area is a combination of several factors. We are measuring the first three of these:
  - Depth of the vegetated area (the filter strip or buffer strip)
  - Slope of stream bank
  - Type and quality of vegetation – percent ground cover
  - Intensity of rain event
  - Amount of fines already in the vegetative filter

For example, a study in Iowa showed that on a 7-12% slope, 10 feet of vegetation filtered out 70% of the sediment, and 30 feet filtered out 95%. Nutrients and bacteria are transported with the sediment.

- The stream bank itself can be a source of nutrient loading. We are providing a rough evaluation of stream bank stability. If this becomes a “key site,” further measurement of stream bank stability are recommended,
- Bank slope greater than 45 degrees may indicate bank instability. Bank slope is determined at the 3-year flood level (bank full), and is an estimated average of the slope for a given length of stream.

## Evidence of Pollutant Loading

This is direct evidence of pollutant loading. However, it is principally qualitative and not quantitative; therefore it is added to the other evidence collected to determine potential nutrient/bacteria source contribution and potential remediation sites. Follow-up monitoring should be considered at sites with significant evidence of pollutant loading.

- Measure distance from edge of water where possible and appropriate.
- Document these using photographs and these field notes, attaching other information when available.
- Do follow-up monitoring at sites to further document source contributions. Some impacted sites will become project sites or “key sites” where baseline documentation of impacts can provide clear evidence of success in the future.

## Follow-up Monitoring

Follow-up monitoring should be completed at some sites to determine sources and develop baseline measurements at “key sites” and “reference sites.”

Each of these methods requires additional field equipment and follows specific protocols.

- **E. coli bacteria** should be collected at sites with *flowing* water. Note that samples collected during flood flows with turbid water and first flush of storm water events are usually contaminated. Samples collected after a runoff event, but with low or normal turbidity are best for establishing baseline data and for determining the effectiveness of watershed improvements.
- **Proper Functioning Condition (PFC) of the Riparian Areas** (using USFS/BLM protocols) are very useful for determining effectiveness of many watershed improvements. They are relatively qualitative (subjective) and require trained investigators, with a level of expertise so that evaluations can be judged consistent over time and at different locations.
- **Pebble counts** can be used to determine excessive bottom deposits, which may contain nutrient loads from the watershed. This would be valuable measurement at key sites where sedimentation has been observed. Use ADEQ protocols, which require a minimum of 300 feet of stream reach.
- **Bank Erosion Hazard Index (BEHI)** of a stream bank may be used to further quantify stream-bank erosion. Use ADEQ protocols.
- **Biocriteria** are useful where working in wadeable, flowing, perennial streams. Use Arizona’s Biocriteria standard (when adopted) and Indices of Biological Integrity and ADEQ’s protocols. ADEQ is also investigating the use of biocriteria on intermittent streams. Data collected on intermittent or perennial streams may be useful for determining effectiveness of watershed improvements.
- **Algal and aquatic vegetation identification, turbidity measurements, flow measurements, and nutrient samples** may also be useful. How useful will depend on the site, as many factors must be considered. The usefulness is also dependant on being able to test accurately at a low enough concentration.

# Septic System Survey Form

Still need to make this form, but the form would include the following items:

Type of system  
Age of system  
Design approved and on file \_\_\_\_\_

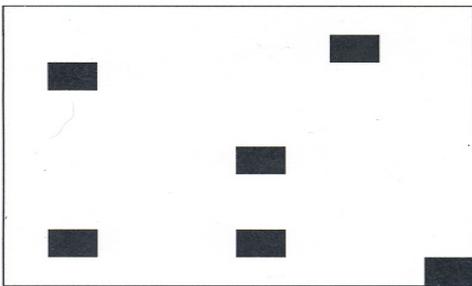
When septic system last pumped?  
Frequency of pumping?  
Frequency of maintenance? Repairs?

The septic tank and leaching system location  
Distance from surface water or wash  
Slope  
Type of soil (clay, mixed loam, gravels  
Distance to well water (theirs and their neighbors)

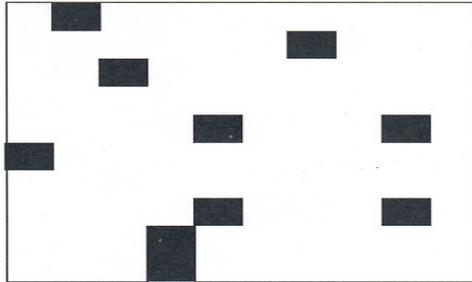
Evidence of discharge: \_\_\_\_\_



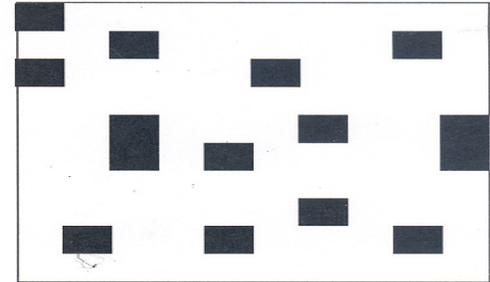
# Percent Ground Cover



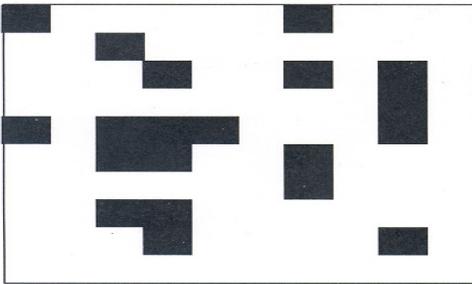
5%



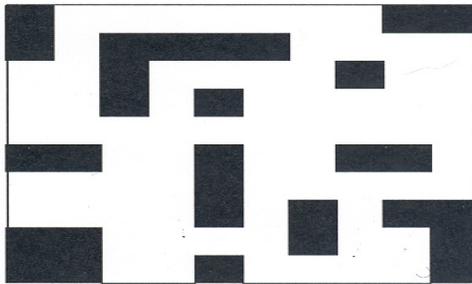
10%



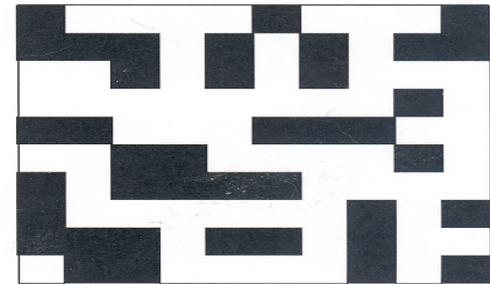
15%



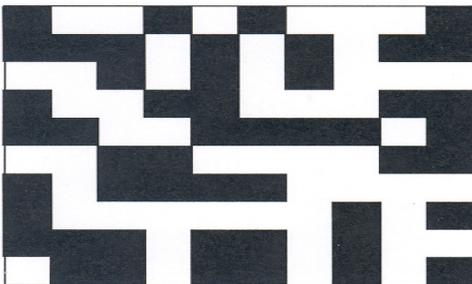
20%



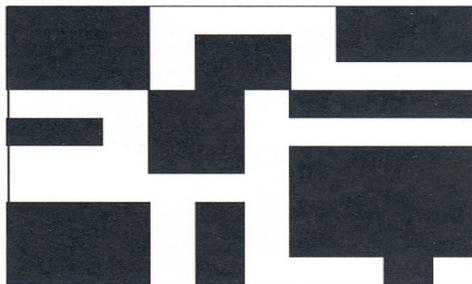
30%



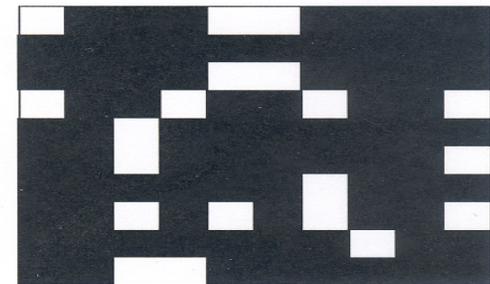
40%



50%



60%



80%